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D.K. Gillmor  
American Civil Liberties Union  
B. Hoeneisen  
pEp Foundation  
A. Melnikov  
Isode Ltd  
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Header Protection for S/MIME  
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## Abstract

S/MIME version 3.1 introduced a mechanism to provide end-to-end cryptographic protection of e-mail message headers. However, few implementations generate messages using this mechanism, and several legacy implementations have revealed rendering or security issues when handling such a message.

This document updates the S/MIME specification to offer a different mechanism that provides the same cryptographic protections but with fewer downsides when handled by legacy clients. Furthermore, it offers more explicit guidance for clients when generating or handling e-mail messages with cryptographic protection of message headers.

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Internet-Draft

Header Protection S/MIME

March 2022

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## [1.](#) Introduction

Privacy and security issues regarding email Header Protection in S/MIME have been identified for some time. Most current implementations of cryptographically-protected electronic mail protect only the body of the message, which leaves significant room for attacks against otherwise-protected messages. For example, lack of header protection allows an attacker to substitute the message subject and/or author.

This document describes two different structures for how message headers can be cryptographically protected, and provides guidance for implementers of MUAs that generate and interpret such messages. It takes particular care to ensure that messages interact reasonably well with legacy MUAs.

### [1.1.](#) Two Schemes of Header Protection

This document addresses two different schemes for cryptographically protecting email header sections or fields and provides guidance to implementers.

One scheme is the form specified in S/MIME 3.1 and later, which involves wrapping a message/rfc822 or message/global MIME object with a Cryptographic Envelope around the message to protect. This document calls this scheme "Wrapped Message", and it is documented in more detail in [[RFC8551](#)]. Experience has shown that this form does not interact well with some legacy MUAs (see [Section 1.2](#)).

Consequently, another form of header protection is introduced, where the protected header fields are placed directly on the Cryptographic

Payload, without using an intervening message/\* MIME object. This document calls this scheme "Injected Headers", and it is documented in more detail in this document, in [Section 2.3.3](#) and [Section 2.5.3](#).

## [1.2.](#) Problems with Wrapped Messages

Several legacy MUAs have revealed rendering issues when dealing with a message that uses the Wrapped Message header protection scheme.

In the worst cases, some mail user agents cannot render message/[rfc822](#) message subparts at all, in violation of baseline MIME requirements as described on page 5 of [\[RFC2049\]](#). This leaves all wrapped messages unreadable by any recipient using such a MUA.

In other cases, the user sees an attachment suggesting a forwarded email message, which -- in fact -- contains the protected email message that should be rendered directly. In most of these cases, the user can click on the attachment to view the protected message.

However, viewing the protected message as an attachment in isolation may strip it of any security indications, leaving the user unable to assess the cryptographic properties of the message. Worse, for encrypted messages, interacting with the protected message in isolation may leak contents of the cleartext, for example, if the reply is not also encrypted.

## [1.3.](#) Problems with Injected Headers

A legacy MUA dealing with an encrypted message that has some header fields obscured using the Injected Headers scheme will not render the obscured header fields to the user at all. A workaround "legacy display" mechanism is provided in this document, which most legacy MUAs should render to the user, albeit not in the same location that the header fields would normally be rendered.

#### [1.4.](#) Motivation

Users generally do not understand the distinction between message body and message header. When an e-mail message has cryptographic protections that cover the message body, but not the header fields, several attacks become possible.

For example, a legacy signed message has a signature that covers the body but not the header fields. An attacker can therefore modify the header fields (including the Subject header) without invalidating the signature. Since most readers consider a message body in the context of the message's Subject header, the meaning of the message itself could change drastically (under the attacker's control) while still retaining the same cryptographic indicator of authenticity.

In another example, a legacy encrypted message has its body effectively hidden from an adversary that snoops on the message. But if the header fields are not also encrypted, significant information about the message (such as the message Subject) will leak to the inspecting adversary.

However, if the sending and receiving MUAs ensure that cryptographic protections cover the message headers as well as the message body, these attacks are defeated.

##### [1.4.1.](#) Backward Compatibility

If the sending MUA is unwilling to generate such a fully-protected message due to the potential for rendering, usability, deliverability, or security issues, these defenses cannot be realized.

The sender cannot know what MUA (or MUAs) the recipient will use to handle the message. Thus, an outbound message format that is backward-compatible with as many legacy implementations as possible is a more effective vehicle for providing the whole-message cryptographic protections described above.



the extent possible. In some cases, like when a user-visible header like the Subject is cryptographically hidden, the message cannot behave entirely identically to a legacy client. But accommodations are described here that ensure a rough semantic equivalence for legacy clients even in these cases.

#### [1.4.2.](#) Deliverability

A message that cannot be delivered is less useful than a message with perfect cryptographic protections. Senders want their messages to reach the intended recipients.

Given the current state of the Internet mail ecosystem, encrypted messages in particular cannot shield all of their header fields from visibility and still be guaranteed delivery to their intended recipient.

This document accounts for this concern by providing a mechanism ([Section 2.3.2](#)) that prioritizes initial deliverability (at the cost of some header leakage) while facilitating future message variants that shield more header metadata from casual inspection.

#### [1.5.](#) Other Protocols to Protect Email Header Fields

A separate pair of protocols also provides some cryptographic protection for the email message header integrity: DomainKeys Identified Mail (DKIM) [[RFC6376](#)], as used in combination with Domain-based Message Authentication, Reporting, and Conformance (DMARC) [[RFC7489](#)]. This pair of protocols provides a domain-based reputation mechanism that can be used to mitigate some forms of unsolicited email (spam).

However, the DKIM+DMARC suite provides cryptographic protection at a different scope than the mechanisms described here. In particular, the message integrity and authentication signals provided by DKIM+DMARC correspond to the domain name of the sending e-mail address, not the sending address itself, so DKIM+DMARC not provide end-to-end protection. DKIM+DMARC are typically applied to messages by (and interpreted by) mail transfer agents, not mail user agents. The mechanisms in this document are typically applied to messages by (and interpreted by) mail user agents.

Furthermore, DKIM+DMARC only provides cryptographic integrity and authentication, not encryption. So cryptographic confidentiality is not available from that suite.

DKIM+DMARC can be used on any message, including messages formed as described in this document. There should be no conflict between these schemes.

#### [1.6.](#) Applicability to PGP/MIME

This document describes end-to-end cryptographic protections for e-mail messages in reference to S/MIME ([\[RFC8551\]](#)).

Comparable end-to-end cryptographic protections can also be provided by PGP/MIME ([\[RFC3156\]](#)).

The mechanisms in this document should be applicable in the PGP/MIME protections as well as S/MIME protections, but analysis and implementation in this document focuses on S/MIME.

To the extent that any divergence from the mechanism described here is necessary for PGP/MIME, that divergence is out of scope for this document.

#### [1.7.](#) Requirements Language

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 [\[RFC2119\]](#).

#### [1.8.](#) Terms

The following terms are defined for the scope of this document:

- \* S/MIME: Secure/Multipurpose Internet Mail Extensions (see [\[RFC8551\]](#))
- \* PGP/MIME: MIME Security with OpenPGP (see [\[RFC3156\]](#))
- \* Message: An Email Message consisting of Header Fields (collectively called "the Header Section of the message") followed, optionally, by a Body; see [\[RFC5322\]](#).

Note: To avoid ambiguity, this document avoids using the terms "Header" or "Headers" in isolation, but instead always uses "Header Field" to refer to the individual field and "Header Section" to refer to the entire collection.

- \* Header Field: A Header Field is a line beginning with a field name, followed by a colon (":"), followed by a field body (value),

and terminated by CRLF; see [[RFC5322](#)].

- \* **Header Section:** The Header Section is a sequence of lines of characters with special syntax as defined in [[RFC5322](#)]. It is the top section of a Message, and it contains the Header Fields associated with the Message itself.
- \* **Body:** The Body is the part of a Message that follows the Header Section and is separated from the Header Section by an empty line (i.e., a line with nothing preceding the CRLF); see [[RFC5322](#)]. It is the (bottom) section of Message containing the payload of a Message. Typically, the Body consists of a (possibly multipart) MIME [[RFC2045](#)] construct.
- \* **Header Protection:** cryptographic protection of email Header Sections (or parts of it) for signatures and/or encryption
- \* **Cryptographic Layer, Cryptographic Payload, Cryptographic Envelope, Structural Headers, Main Body Part, User-Facing Headers, and MUA** are all used as defined in [[I-D.ietf-lamps-e2e-mail-guidance](#)]
- \* **Legacy MUA:** a MUA that does not understand header protection as described in this document. A Legacy Non-Crypto MUA is incapable of doing any end-to-end cryptographic operations. A Legacy Crypto MUA is capable of doing cryptographic operations, but does not understand or generate messages with header protection.
- \* **Wrapped Message:** The header protection scheme that uses the mechanism described in [[RFC8551](#)], where the Cryptographic Payload is a message/rfc822 or message/global MIME object. (see [Section 2.2](#)).
- \* **Injected Headers:** The header protection scheme that uses the mechanism described in this document (see [Section 2.1](#)), where the protected header fields are inserted on the Cryptographic Payload directly.
- \* **Header Confidentiality Policy:** a functional specification of which header fields should be obscured when composing an encrypted message with header protection. See [Section 2.3.2](#).

## [1.9.](#) Document Scope

This document describes sensible, simple behavior for a program that generates an e-mail message with standard end-to-end cryptographic protections, following the guidance in [\[I-D.ietf-lamps-e2e-mail-guidance\]](#). An implementation conformant to this draft will produce messages that have cryptographic protection that covers the message's headers as well as its body.

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This document also describes sensible, simple behavior for a program that interprets such a message, in a way that can take advantage of these protections covering the header fields as well as the body.

The message generation guidance aims to minimize negative interactions with any legacy receiving client while providing actionable cryptographic properties for modern receiving clients.

In particular, this document focuses on two standard types of cryptographic protection that cover the entire message:

- \* A cleartext message with a single signature, and
- \* An encrypted message that contains a single cryptographic signature.

### [1.9.1.](#) Out of Scope

While the generation guidance aims to provide minimal disruption for any legacy client, such a client by definition does not implement this document.

Therefore, the document does not attempt to provide guidance for legacy clients.

Furthermore, this document does not explicitly contemplate unusual (and tricky) variants of cryptographic message protections, including any of these:

- \* Encrypted-only message (without a cryptographic signature)
- \* Triple-wrapped message

- \* Signed message with multiple signatures
- \* Encrypted message with a cryptographic signature outside the encryption.

All such messages are out of scope.

## [2.](#) Specification

As mentioned in [Section 1.1](#), this document describes two ways to provide end-to-end cryptographic protection for an e-mail message that includes all header fields known to the sender at message composition time.

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A receiving MUA MUST be able to handle both header protection schemes, as described in [Section 2.5](#).

A sending MUA MUST be able to generate the Injected Headers scheme ([Section 2.3.3](#)), and MAY generate the Wrapped Message scheme ([Section 2.3.4](#)).

### [2.1.](#) Injected Headers Scheme

The Injected Headers scheme places all header fields to be protected directly into the header section of the Cryptographic Payload.

For an encrypted message that has at least one user-visible header field omitted or obscured outside of the Cryptographic Payload, those header fields MAY also be duplicated into decorative copies in the Main Body MIME part of the Cryptographic Payload itself. These decorative copies within the message are known as "legacy display elements".

Composing a message with the Injected Headers scheme is described in [Section 2.3.3](#). Rendering such a message is described in [Section 2.5.3](#).

### [2.2.](#) Wrapped Message Scheme

The Wrapped Message scheme creates a message/rfc822 (or message/global) MIME object containing the message and all header fields to be protected, and then uses that encapsulated MIME part as the Cryptographic Payload.

Composing a message with the Wrapped Message scheme is described in [Section 2.3.4](#). Rendering such a message is described in [Section 2.5.4](#).

## [2.3](#). Sending Side

This section describes the process an MUA should use to apply cryptographic protection to an e-mail message with header protection. We start by describing the legacy message composition process as a baseline.

### [2.3.1](#). Composing a Cryptographically-Protected Message Without Header Protection

[I-D.ietf-lamps-e2e-mail-guidance] describes the typical process for a legacy crypto MUA to apply cryptographic protections to an e-mail message. That guidance and terminology is replicated here for reference:

- \* origbody: the traditional unprotected message body as a well-formed MIME tree (possibly just a single MIME leaf part). As a well-formed MIME tree, origbody already has structural headers (Content-\*) present.
- \* origheaders: the intended non-structural headers for the message, represented here as a list of (h,v) pairs, where h is a header field name and v is the associated value. Note that these are header fields that the MUA intends to be visible to the recipient of the message. In particular, if the MUA uses the Bcc header during composition, but plans to omit it from the message (see [section 3.6.3 of \[RFC5322\]](#)), it will not be in origheaders.
- \* crypto: The series of cryptographic protections to apply (for example, "sign with the secret key corresponding to X.509 certificate X, then encrypt to X.509 certificates X and Y"). This is a routine that accepts a MIME tree as input (the Cryptographic Payload), wraps the input in the appropriate Cryptographic

Envelope, and returns the resultant MIME tree as output.

The algorithm returns a MIME object that is ready to be injected into the mail system:

- \* Apply crypto to origbody, yielding MIME tree output
- \* For each header name and value (h,v) in origheaders:
  - Add header h of output with value v
- \* Return output

### [2.3.2.](#) Header Confidentiality Policy

When composing an encrypted message with header protection, the composing MUA needs a Header Confidentiality Policy (HCP). In this document, we represent that Header Confidentiality Policy as a function hcp:

- \* hcp(name, val\_in) --> val\_out: this function takes a header field name name and initial value val\_in as arguments, and returns a replacement header value val\_out. If val\_out is the special value null, it mean that the header field in question should be omitted from the set of header fields visible outside the Cryptographic Envelope.

For example, an MUA that only obscures the Subject header field by replacing it with the literal string [...] and does not offer confidentiality to any other header fields would be represented as (in pseudocode):

```
hcp(name, val_in) → val_out:
  if name is 'Subject':
    return '['...']'
  else:
    return val_in
```

Note that such a policy is only needed when the end-to-end protections include encryption (confidentiality). No comparable policy is needed for other end-to-end cryptographic protections (integrity and authenticity), as they are simply uniformly applied so that all header fields known by the sender have these protections.

This asymmetry is an unfortunate consequence of complexities in message delivery systems, some of which may reject, drop, or delay messages where all header fields are removed from the top-level MIME object.

This document does not mandate any particular Header Confidentiality Policy, though it offers guidance for MUA implementers in selecting one in [Section 2.4](#). Future documents may recommend or mandate such a policy for an MUA with specific needs. Such a recommendation might be motivated by descriptions of metadata-derived attacks, or stem from research about message deliverability, or describe new signalling mechanisms, but these topics are out of scope for this document.

### [2.3.3](#). Composing with "Injected Headers" Header Protection

The "Injected Headers" header protection scheme places the header fields to be protected directly on the cryptographic payload. Unlike in the "Wrapped Scheme" (see `compose-wrapped-message`), there is no wrapping of the message body in any additional message/\* MIME part. This section describes how to generate such a message.

To compose a message using "Injected Headers" header protection, the composing MUA needs one additional input in addition to the Header Confidentiality Policy `hcp` defined in [Section 2.3.2](#).

- \* `legacy`: a boolean value, indicating whether any recipient of the message is believed to have a legacy client. If all recipients are known to implement this draft, `legacy` should be set to false. (How a MUA determines the value of `legacy` is out of scope for this document; an initial implementation can simply set it to true)

Enabling visibility of obscured header fields for decryption-capable legacy clients requires transforming a header list into a readable form and including it as a decorative "Legacy Display" element in specially-marked parts of the message. This document recommends two



different mechanisms for such a decorative adjustment: one for a text/html Main Body part of the e-mail message, and one for a text/plain Main Body part. This document does not recommend adding a Legacy Display element to any other part.

Please see [[I-D.ietf-lamps-e2e-mail-guidance](#)] for guidance on identifying the parts of a message that are a Main Body Part.

The revised algorithm for applying cryptographic protection to a message is as follows:

- \* if crypto contains encryption, and legacy is true:
  - Create ldlist, an empty list of (header, value) pairs
  - For each header field name and value (h,v) in origheaders:
    - o If h is user-facing (see [[I-D.ietf-lamps-e2e-mail-guidance](#)]):
      - + If hcp(h,v) is not v:
        - \* Append (h,v) to ldlist
  - If ldlist is not empty:
    - o Identify each leaf MIME part of payload that represents the "main body" of the message.
    - o For each "Main Body Part" bodypart of type text/plain or text/html:
      - + Insert Legacy Display element header list ldlist into the content of bodypart (see [Section 2.3.3.1](#) for text/plain and [Section 2.3.3.2](#) for text/html)
      - + Add Content-Type parameter hp-legacy-display with value 1 to bodypart
- \* For each header field name and value (h,v) in origheaders:
  - Add header field h of MIME part payload with value v

- \* Set the protected-headers parameter on the Content-Type of payload to v1
- \* Apply crypto to payload, producing MIME tree output
- \* If crypto contains encryption:
  - Create new empty list of header field names and values newh
  - For header field name and value (h,v) in origheaders:
    - o Let newval be hcp(h,v)
    - o If newval is not null:
      - + Add newh[h] to newval
  - Set origheaders to newh
- \* For each header field name and value (h,v) in origheaders:
  - Add header field h of output with value v
- \* Return output

Note that both new parameters (hcp and legacy) are effectively ignored if crypto does not contain encryption. This is by design, because they are irrelevant for signed-only cryptographic protections.

#### [2.3.3.1](#). Adding a Legacy Display Element to a text/plain Part

For a list of obscured header fields represented as (header, value) pairs, concatenate them as a set of lines, with one newline at the end of each pair. Add an additional trailing newline after the resultant text, and prepend the entire list to the body of the text/plain part.

For example, if the list of obscured header fields was [{"Cc", "alice@example.net"}, {"Subject", "Thursday's meeting"}], then a text/plain part that originally contained:

I think we should skip the meeting.

Would become:

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Subject: Thursday's meeting  
Cc: alice@example.net

I think we should skip the meeting.

#### [2.3.3.2.](#) Adding a Legacy Display Element to a text/html Part

Adding a Legacy Display Element to a text/html part is similar to how it is added to a text/plain part (see [Section 2.3.3.1](#)). Instead of adding the obscured header fields to a block of text delimited by a blank line, the composing MUA injects them in an HTML <div> element annotated with a class attribute of header-protection-legacy-display.

The content and formatting of this decorative <div> have no strict requirements, but they SHOULD represent all the obscured header fields in a readable fashion. A simple approach is to assemble the text in the same way as [Section 2.3.3.1](#), wrap it in a verbatim <pre> element, and put that element in the annotated <div>.

The annotated <div> should be placed as close to the start of the <body> as possible, where it will be visible when viewed with a standard HTML renderer.

For example, if the list of obscured header fields was [("Cc", "alice@example.net"), ("Subject", "Thursday's meeting")], then a text/html part that originally contained:

```
<html><head><title></title></head><body>
<p>I think we should skip the meeting.</p>
</body></html>
```

Would become:

```
<html><head><title></title></head><body>
<div class="header-protection-legacy-display">
<pre>Subject: Thursday's meeting
Cc: alice@example.net</pre></div>
<p>I think we should skip the meeting.</p>
</body></html>
```

### [2.3.3.3.](#) Only Add a Legacy Display Element to Main Body Parts

Some messages may contain a text/plain or text/html subpart that is not a main body part. For example, an e-mail message might contain an attached text file or a downloaded webpage. Attached documents need to be preserved as intended in the transmission, without modification.

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The composing MUA MUST NOT add a Legacy Display element to any part of the message that is not a main body part. In particular, if a part is annotated with Content-Disposition: attachment, or if it does not descend via the first child of any of its multipart/mixed or multipart/related ancestors, it is not a main body part, and MUST NOT be modified.

See [[I-D.ietf-lamps-e2e-mail-guidance](#)] for more guidance about common ways to distinguish main body parts from other MIME parts in a message.

### [2.3.3.4.](#) Do Not Add a Legacy Display Element to Other Content-Types

The purpose of injecting a Legacy Display element into each Main Body MIME part is to enable rendering of otherwise obscured header fields in legacy clients that are capable of message decryption, but don't know how to follow the rest of the guidance in this document.

The authors are unaware of any legacy client that would render any MIME part type other than text/plain and text/html as the Main Body. A generating MUA SHOULD NOT add a Legacy Display element to any MIME part with any other Content-Type.

### [2.3.4.](#) Composing with "Wrapped Message" Header Protection

The Wrapped Message header protection scheme is briefly documented in [Section 3.1 \[RFC8551\]](#). This section provides a more detailed explanation of how to build such a message, and augments it with the forwarded parameter as described in [[I-D.melnikov-iana-reg-forwarded](#)].

To compose a message using "Wrapped Message" header protection, we use those inputs described in [Section 2.3.1](#) plus the Header

Confidentiality Policy hcp defined in [Section 2.3.2](#). The new algorithm is:

- \* For header field name and value (h,v) in origheaders:
  - Add header field h of origbody with value v
- \* If any of the header fields in origbody, including header fields in the nested internal MIME structure, contain any 8-bit UTF-8 characters (see section [section 3.7 of \[RFC6532\]](#)):
  - Let payload be a new MIME part with one header field: Content-Type: message/global; forwarded=no, and whose body is origbody.
- \* Else:

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- Let payload be a new MIME part with one header field: Content-Type: message/rfc822; forwarded=no, and whose body is origbody.
- \* Apply crypto to payload, yielding MIME tree output
- \* If crypto contains encryption:
  - Create new empty list of header field names and values newh
  - For header field name and value (h,v) in origheaders:
    - o Let newval be hcp(h,v)
    - o If newval is not null:
      - + Append (h,newval) to newh
  - Set origheaders to newh
- \* For header field name and value (h,v) in origheaders:
  - Add header field h of output with value v
- \* Return output

Note that the Header Confidentiality Policy hcp is ignored if crypto

does not contain encryption. This is by design.

#### [2.3.5.](#) Choosing Between Wrapped Message and Injected Headers

When composing a message with end-to-end cryptographic protections, an MUA SHOULD protect the header fields of that message as well as the body, using one of the formats described here.

A compatible MUA MUST be capable of generating a message with header protection using the Injected Headers [Section 2.3.3](#) format.

#### [2.4.](#) Default Header Confidentiality Policy

An MUA SHOULD have a sensible default Header Confidentiality Policy, and SHOULD NOT require the user to select one.

The default Header Confidentiality Policy SHOULD provide confidentiality for the Subject header field by replacing it with the literal string [...]. Most users treat the Subject of a message the same way that they treat the body, and they are surprised to find that the Subject of an encrypted message is visible.

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```
[[ TODO: select one of the two policies below the recommended default
]]
```

##### [2.4.1.](#) Minimalist Header Confidentiality Policy

Accordingly, the most conservative recommended Header Confidentiality Policy only protects the Subject:

```
hcp_minimal(name, val_in) → val_out:
    if name is 'Subject':
        return '['...']'
    else:
        return val_in
```

##### [2.4.2.](#) Strong Header Confidentiality Policy

Alternately, a more aggressive (and therefore more privacy-preserving) Header Confidentiality Policy only leaks a handful of fields whose absence is known to increase rates of delivery failure,

and simultaneously obscures the Message-ID behind a random new one:

```
hcp_strong(name, val_in) → val_out:
    if name in ['From', 'To', 'Cc', 'Date']:
        return val_in
    else if name is 'Subject':
        return ' [...]'
    else if name is 'Message-ID':
        return generate_new_message_id()
    else:
        return null
```

The function `generate_new_message_id()` represents whatever process the MUA typically uses to generate a Message-ID for a new outbound message.

#### [2.4.3.](#) Offering Stronger Header Confidentiality

A MUA MAY offer even stronger confidentiality for header fields of an encrypted message than described in [Section 2.4.2](#). For example, it might implement an HCP that obfuscates the From field, or omits the Cc field, or ensures Date is represented in UTC (obscuring the local timezone).

The authors of this document hope that implementers with deployment experience will document their chosen Header Confidentiality Policy and the rationale behind their choice.

#### [2.5.](#) Receiving Side

An MUA that receives a cryptographically-protected e-mail will render it for the user.

The receiving MUA will render the message body, a selected subset of header fields, and (as described in [\[I-D.ietf-lamps-e2e-mail-guidance\]](#)) provide a summary of the cryptographic properties of the message.

Most MUAs only render a subset of header fields by default. For example, few MUAs typically render Message-Id or Received header

fields for the user, but most do render From, To, Cc, Date, and Subject.

A MUA that knows how to handle a message with header protection makes the following two changes to its behavior when rendering a message:

- \* If it detects that an incoming message had protected header fields, it renders header fields for the message from the protected header fields, ignoring the external (unprotected) header fields.
- \* It includes information in the message's cryptographic summary to indicate the types of protection that applied to each rendered header field (if any).

A MUA that handles a message with header protection does not need to render any new header fields that it did not render before.

#### [2.5.1](#). Identifying that a Message has Header Protection

An incoming message can be identified as having header protection based on one of two signals:

- \* The Cryptographic Payload has Content-Type: message/rfc822 or Content-Type: message/global and the parameter forwarded has a value of no. See [Section 2.5.4](#) for rendering guidance.
- \* The Cryptographic Payload has some other Content-Type and it has parameter protected-headers set to v1. See [Section 2.5.3](#) for rendering guidance.

Messages of both types exist in the wild, and a compliant MUA **MUST** be able to handle them both. They provide the same semantics and the same meaning.

#### [2.5.2](#). Updating the Cryptographic Summary

Regardless of whether a cryptographically-protected message has protected header fields, the cryptographic summary of the message should be modified to indicate what protections the header fields



have.

Each header field individually has exactly one the following protections:

- \* unprotected (this is the case for all header fields in messages that have no header protection)
- \* signed-only (bound into the same validated signature as the enclosing message, but also visible in transit)
- \* encrypted-only (only appears within the cryptographic payload; the corresponding external header field was either omitted or obfuscated)
- \* signed-and-encrypted (same as encrypted-only, but additionally is under a validated signature)

Note that while the message itself may be signed-and-encrypted, some header fields may be replicated on the outside of the message (e.g. Date). Those header fields would be signed-only, despite the message itself being signed-and-encrypted.

Rendering this information is likely to be complex and messy --- users may not understand it. It is beyond the scope of this document to suggest any specific graphical affordances or user experience. Future work should include examples of successful rendering of this information.

### [2.5.3.](#) Rendering a Message with Injected Headers

When the Cryptographic Payload does not have a Content-Type of message/rfc822 or message/global, and the parameter protected-headers is set to v1, the values of the protected header fields are drawn from the header fields of the Cryptographic Payload, and the body that is rendered is the Cryptographic Payload itself.

#### [2.5.3.1.](#) Example Signed-only Message with Injected Headers

```

A └─ application/pkcs7-mime; smime-type="signed-data"
    ↓ (unwraps to)
B └─ multipart/alternative [Cryptographic Payload + Rendered Body]
    └─ C └─ text/plain
        D └─ text/html

```

The message body should be rendered the same way as this message:

```

B └─ multipart/alternative
    └─ C └─ text/plain
        D └─ text/html

```

It should render header fields taken from part B.

Its cryptographic summary should indicate that the message was signed and all rendered header fields were included in the signature.

The MUA SHOULD ignore header fields from part A for the purposes of rendering.

#### [2.5.3.2.](#) Example Signed-and-Encrypted Message with Injected Headers

Consider a message with this structure, where the MUA is able to validate the cryptographic signature:

```

E └─ application/pkcs7-mime; smime-type="enveloped-data"
    ↓ (decrypts to)
F └─ application/pkcs7-mime; smime-type="signed-data"
    ↓ (unwraps to)
G └─ multipart/alternative [Cryptographic Payload + Rendered Body]
    └─ H └─ text/plain
        I └─ text/html

```

The message body should be rendered the same way as this message:

```

G └─ multipart/alternative
    └─ H └─ text/plain
        I └─ text/html

```

It should render header fields taken from part G.

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Its cryptographic summary should indicate that the message was signed and encrypted. As in [Section 2.5.4.2](#), each rendered header field found in G should be compared against the header field of the same name from E. If the value found in E matches the value found in G, the header field should be marked as signed-only. If no matching header field was found in E, or the value found did not match the value from G, the header field should be marked as signed-and-encrypted.

#### [2.5.3.3](#). Do Not Render Legacy Display Elements

As described in [Section 2.1](#), a message with cryptographic confidentiality protection MAY include "Legacy Display" elements for backward-compatibility with legacy MUAs. These Legacy Display elements are strictly decorative, unambiguously identifiable, and will be discarded by compliant implementations.

The receiving MUA SHOULD avoid rendering the identified Legacy Display elements to the user at all, since it is aware of header protection and can render the actual protected header fields.

If a text/html or text/plain part within the cryptographic envelope is identified as containing Legacy Display elements, those elements should be hidden when rendering or generating a draft reply.

##### [2.5.3.3.1](#). Identifying a Part with Legacy Display Elements

A receiving MUA acting on a message that contains an encrypting Cryptographic Layer identifies a MIME subpart within the Cryptographic Payload as containing Legacy Display elements based on the Content-Type of the subpart.

- \* The subpart's Content-Type contains a parameter hp-legacy-display with value set to 1
- \* The subpart's Content-Type is either text/html (see [Section 2.5.3.3.3](#)) or text/plain (see [Section 2.5.3.3.2](#))

Note that the term "subpart" above is used in the general sense: if the Cryptographic Payload is a single part, that part itself may contain a Legacy Display element if it is marked with the hp-legacy-display=1 parameter.

#### [2.5.3.3.2.](#) Omitting Legacy Display Elements from text/plain

If a text/plain part within the Cryptographic Payload has the Content-Type parameter `hp-legacy-display="1"`, it should be processed before rendering in the following fashion:

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- \* Discard the leading lines of the body of the part up to and including the first entirely blank line.

Note that implementing this strategy is dependent on the charset used by the MIME part.

See [Appendix D.1](#) for an example.

#### [2.5.3.3.3.](#) Omitting Legacy Display Elements from text/html

If a text/html part within the Cryptographic Payload has the Content-Type parameter `hp-legacy-display="1"`, it should be processed before rendering in the following fashion:

- \* If any element of the HTML `<body>` is a `<div>` with class attribute `header-protection-legacy-display`, that entire element should be omitted.

A straightforward way for an HTML-capable MUA to do this is to add an entry to the [\[CSS\]](#) stylesheet for such a part:

```
body div.header-protection-legacy-display { display: none; }
```

#### [2.5.4.](#) Rendering a Wrapped Message

Some MUAs may compose and send a message with end-to-end cryptographic protections that offer header protection using the Wrapped Message scheme described in [Section 3.1 of \[RFC8551\]](#). This section describes how a receiving MUA should identify and render such a message.

When the Cryptographic Payload has Content-Type of `message/rfc822` or `message/global`, and the parameter `forwarded` is set to `no`, the values of the protected header fields are drawn from the header fields of the Cryptographic Payload, and the body that is rendered is the body

of the Cryptographic Payload.

#### [2.5.4.1.](#) Example Signed-Only Wrapped Message

Consider a message with this structure, where the MUA is able to validate the cryptographic signature:

```
J └─ application/pkcs7-mime; smime-type="signed-data"
    ↓ (unwraps to)
K └─ message/rfc822 [Cryptographic Payload]
    └─ multipart/alternative [Rendered Body]
        └─ text/plain
        └─ text/html
```

The message body should be rendered the same way as this message:

```
L └─ multipart/alternative
M └─ text/plain
N └─ text/html
```

It should render header fields taken from part K.

Its cryptographic summary should indicate that the message was signed and all rendered header fields were included in the signature.

The MUA SHOULD ignore header fields from part J for the purposes of rendering.

#### [2.5.4.2.](#) Example Signed-and-Encrypted Wrapped Message

Consider a message with this structure, where the MUA is able to validate the cryptographic signature:

```
O └─ application/pkcs7-mime; smime-type="enveloped-data"
    ↓ (decrypts to)
P └─ application/pkcs7-mime; smime-type="signed-data"
    ↓ (unwraps to)
Q └─ message/rfc822 [Cryptographic Payload]
    └─ multipart/alternative [Rendered Body]
        └─ text/plain
        └─ text/html
```

The message body should be rendered the same way as this message:

```
R  ┌ multipart/alternative
S  └── text/plain
T  └── text/html
```

It should render header fields taken from part Q.

Its cryptographic summary should indicate that the message was signed and encrypted. Each rendered header field found in Q should be compared against the header field of the same name from O. If the value found in O matches the value found in Q, the header field should be marked as signed-only. If no matching header field was found in O, or the value found did not match the value from Q, the header field should be marked as signed-and-encrypted.

#### [2.5.5.](#) Guidance for Automated Message Handling

Some automated systems have a control channel that is operated by e-mail. For example, an incoming e-mail message could subscribe someone to a mailing list, initiate the purchase of a specific product, approve another message for redistribution, or adjust the state of some shared object.

To the extent that such a system depends on end-to-end cryptographic guarantees about the e-mail control message, header protection as described in this document should improve the system's security. This section provides some specific guidance for systems that use e-mail messages as a control channel that want to benefit from these security improvements.

##### [2.5.5.1.](#) Interpret Only Protected Header Fields

Consider the situation where an e-mail-based control channel depends on the message's cryptographic signature and the action taken depends on some header field of the message.

In this case, the automated system **MUST** rely on information from the header field that is protected by the mechanism described in this document. It **MUST NOT** rely on any header field found outside the cryptographic payload.

For example, consider an administrative interface for a mailing list manager that only accepts control messages that are signed by one of its administrators. When an inbound message for the list arrives, it is queued (waiting for administrative approval) and the system generates and listens for two distinct e-mail addresses related to the queued message -- one that approves the message, and one that rejects it. If an administrator sends a signed control message to the approval address, the mailing list verifies that the protected To: header field of the signed control message contains the approval address before approving the queued message for redistribution. If the protected To: header field does not contain that address, or there is no protected To: header field, then the mailing list logs or reports the error, and does not act on that control message.

#### [2.5.5.2](#). Ignore Legacy Display Elements

Consider the situation where an e-mail based control channel expects to receive an end-to-end encrypted message -- for example, where the control messages need confidentiality guarantees -- and where the action taken depends on the contents of some MIME part within message body.

In this case, the automated system that decrypts the incoming messages and scans the relevant MIME part **SHOULD** identify when the MIME part contains a legacy display element (see [Section 2.5.3.3.1](#)), and it **SHOULD** parse the relevant MIME part with the legacy display element removed.

For example, consider an administrative interface of a confidential issue tracking software. An authorized user can confidentially adjust the status of a tracked issue by a specially-formatted first line of the message body (for example, severity #183 serious). When the user's MUA encrypts a plain text control message to this issue tracker, depending on the MUA's HCP and its choice of legacy value, it may add a legacy display element. If it does so, then the first line of the message body will contain a decorative copy of the

confidential Subject: header field. The issue tracking software decrypts the incoming control message, identifies that there is a legacy display element in the part (see [Section 2.5.3.3.1](#)), strips the legacy display lines (including the first blank line), and only then parses the remaining top line to look for the expected special formatting.

#### [2.5.6.](#) Affordances for Debugging and Troubleshooting

Note that advanced users of an MUA may need access to the original message, for example to troubleshoot problems with the MUA itself, or problems with the SMTP transport path taken by the message.

A MUA that applies these rendering guidelines SHOULD ensure that the full original source of the message as it was received remains available to such a user for debugging and troubleshooting.

#### [2.5.7.](#) Rendering Other Schemes

Other MUAs may have generated different structures of messages that aim to offer end-to-end cryptographic protections that include header protection.

While this document is not normative for those schemes, it offers guidance for how to identify and handle these other formats. In the following a list of systems that are known to generate email messages with end-to-end cryptographic protections that include header protection using a different MIME scheme.

##### [2.5.7.1.](#) Pretty Easy Privacy (pEp)

The pEp (pretty Easy privacy) [[I-D.pep-general](#)] project specifies MIME schemes for Signed-and-Encrypted email messages that also provide header protection [[I-D.pep-email](#)]. Similar to the "Wrapped Messages" scheme described in [Section 2.3.4](#) and [Section 2.5.4](#), pEp email messages are fully encapsulated in the Cryptographic Payload.



More information can be found in [[I-D.pep-email](#)].

#### [2.5.8.](#) Composing a Reply to an Encrypted Message with Header Protection

When composing a reply to an encrypted message with header protection, the MUA is acting both as a receiving MUA and as a sending MUA. Special guidance applies here, as things can go wrong in at least two ways: leaking previously-confidential information, and replying to the wrong party.

##### [2.5.8.1.](#) Avoid Leaking Encrypted Headers in Reply

As noted in [[I-D.ietf-lamps-e2e-mail-guidance](#)], an MUA in this position MUST NOT leak previously-encrypted content in the clear in a followup message. The same is true for protected header fields.

Values from any header field that was identified as either encrypted or signed-and-encrypted based on the steps outlined above MUST NOT be placed in cleartext output when generating a message.

In particular, if Subject was encrypted, and it is copied into the draft encrypted reply, the replying MUA MUST obfuscate the unprotected (cleartext) Subject header field as described above.

[[ TODO: formally describe how a replying MUA should generate a message-specific Header Protection policy based on the cryptographic status of the headers of the incoming message ]]

##### [2.5.8.2.](#) Avoid Misdirected Replies to Encrypted Messages with Header Protection

When replying to a message, the Composing MUA typically decides who to send the reply to based on:

- \* the Reply-To, Mail-Followup-To, or From header fields
- \* optionally, the other To or Cc header fields (if the user chose to "reply all")

When a message has header protection, the replying MUA MUST populate the destination fields of the draft message using the protected header fields, and ignore any unprotected header fields.

This mitigates against an attack where Mallory gets a copy of an encrypted message from Alice to Bob, and then replays the message to Bob with an additional Cc to Mallory's own e-mail address in the message's outer (unprotected) header section.

If Bob knows Mallory's certificate already, and he replies to such a message without following the guidance in this section, it's likely that his MUA will encrypt the cleartext of the message directly to Mallory.

#### [2.5.9.](#) Implicitly-rendered Header Fields

While From and To and Cc and Subject and Date are often explicitly rendered to the user, some header fields do affect message display, without being explicitly rendered.

For example, Message-Id, References, and In-Reply-To header fields may collectively be used to place a message in a "thread" or series of messages.

In another example, [Section 2.5.8.2](#) observes that the value of the Reply-To field can influence the draft reply message. So while the user may never see the Reply-To header field directly, it is implicitly "rendered" when the user interacts with the message by replying to it.

An MUA that depends on any implicitly-rendered header field in a message with header protection SHOULD use the value from the protected header field, and SHOULD NOT use any value found outside the cryptographic protection.

#### [2.5.10.](#) Unprotected Header Fields Added in Transit

Some header fields are legitimately added in transit, and could not have been known to the sender at message composition time.

The most common of these header fields are Received and DKIM-Signature, neither of which are typically rendered, either explicitly or implicitly.

If a receiving MUA has specific knowledge about a given header field, including that:

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- \* the header field would not have been known to the original sender, and
- \* the header field might be rendered explicitly or implicitly,

then the MUA MAY decide to operate on the value of that header field from the unprotected header section, even though the message has header protection.

The MUA MAY prefer to verify that the header fields in question have additional transit-derived cryptographic protections (e.g., to test whether they are covered by a valid DKIM-Signature, see [[RFC6376](#)]) before rendering or acting on them.

Specific examples appear below.

#### [2.5.10.1](#). Mailing list header fields: List-\* and Archived-At

If the message arrives through a mailing list, the list manager itself may inject header fields (most of which start with List-) in the message:

- \* List-Archive
- \* List-Subscribe
- \* List-Unsubscribe
- \* List-Id
- \* List-Help
- \* List-Post
- \* Archived-At

For some MUAs, these header fields are implicitly rendered, by providing buttons for actions like "Subscribe", "View Archived Version", "Reply List", "List Info", etc.

An MUA that receives a message with header protection that contains these header fields in the unprotected section, and that has reason to believe the message is coming through a mailing list MAY decide to

render them to the user (explicitly or implicitly) even though they are not protected.

FIXME: other examples of unprotected transit header fields?

### [3.](#) E-mail Ecosystem Evolution

This document is intended to offer tooling needed to improve the state of the e-mail ecosystem in a way that can be deployed without significant disruption. Some elements of this specification are present for transitional purposes, but would not exist if the system were designed from scratch.

This section describes these transitional mechanisms, as well as some suggestions for how they might eventually be phased out.

#### [3.1.](#) Dropping Legacy Display Elements

Any decorative Legacy Display element added to an encrypted message that uses the Injected Header scheme is present strictly for enabling header field visibility (most importantly, the Subject header field) when the message is viewed with a decryption-capable legacy client.

Eventually, the hope is that most decryption-capable MUAs will conform to this specification, and there will be no need for injection of Legacy Display elements in the message body. A survey of widely-used decryption-capable MUAs might be able to establish when most of them do support this specification.

At that point, a composing MUA could make the legacy parameter described in {#compose-injected-headers} to false by default, or could even hard-code it to false, yielding a much simpler message construction set.

Until that point, an end user might want to signal that their receiving MUAs are conformant to this draft so that a peer composing a message to them can set legacy to false. A signal indicating capability of handling messages with header protection might be placed in the user's cryptographic certificate, or in outbound messages.

This draft doesn't attempt to define the syntax or semantics of such a signal.

#### [4.](#) Usability Considerations

This section describes concerns for MUAs that are interested in easy adoption of header protection by normal users.

While they are not protocol-level artifacts, these concerns motivate the protocol features described in this document.

See also the Usability section in [[I-D.ietf-lamps-e2e-mail-guidance](#)].

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##### [4.1.](#) Mixed Protections Within a Message Are Hard To Understand

[[ TODO ]]

##### [4.2.](#) Users Should Not Have To Choose a Header Confidentiality Policy

[[ TODO ]]

##### [4.3.](#) Users Should Not Have To Choose a Header Protection Scheme

[[ TODO ]]

#### [5.](#) Security Considerations

[[ TODO ]]

#### [6.](#) Privacy Considerations

[[ TODO ]]

#### [7.](#) IANA Considerations

This document requests no action from IANA.

[[ RFC Editor: This section may be removed before publication. ]]

#### [8.](#) Acknowledgments

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## [Appendix A](#). Possible Problems with some Legacy Clients

When an e-mail message with end-to-end cryptographic protection is received by a mail user agent, the user might experience many different possible problematic interactions. A message with header protection may introduce new forms of user experience failure.

In this section, the authors enumerate different kinds of failures we have observed when reviewing, rendering, and replying to messages with different forms of header protection in different legacy MUAs. Different legacy MUAs demonstrate different subsets of these problems.

Hopefully, a non-legacy MUA would not exhibit any of these problems. An implementer updating their legacy MUA to be compliant with this



specification should consider these concerns and try to avoid them.

[A.1.](#) Problems Reviewing signed+encrypted Messages in List View

- \* Unprotected Subject, Date, From, To are visible
- \* Threading is not visible

[A.2.](#) Problems when Rendering a signed+encrypted Message

- \* Unprotected Subject is visible
- \* Protected subject (on its own) is visible in the body
- \* Protected subject, date, from, to visible in the body
- \* User interaction needed to view whole message
- \* User interaction needed to view message body
- \* User interaction needed to view protected subject
- \* Impossible to view protected subject
- \* Nuisance alarms during user interaction
- \* Impossible to view message body
- \* Appears as a forwarded message
- \* Appears as an attachment
- \* Security indicators not visible
- \* User has multiple different methods to Reply: (e.g. reply to outer, reply to inner)
- \* User sees English "Subject:" in body despite message itself being in non-English

- \* Security indicators do not identify protection status of header

fields

- \* Header fields in body render with local header field names (e.g. showing "Betreff" instead of "Subject") and dates (TZ, locale)

### [A.3.](#) Problems when Replying to a signed+encrypted Message

Note that the use case here is:

- \* User views message, to the point where they can read it.
- \* User then replies to message, and they are shown a message composition window, which has some UI elements
- \* If the MUA has multiple different methods to Reply: to a message, each way may need to be evaluated separately

This section also uses the shorthand UI:x to mean "the UI element that the user can edit that they think of as x."

- \* protected subject is in UI:subject (and will leak)
- \* protected subject is quoted in UI:body
- \* protected subject is not anywhere in UI
- \* message body is not visible/quoted in UI:body
- \* user cannot reply while viewing protected message
- \* reply is not encrypted by default (but is for normal S/MIME sign+enc messages)
- \* unprotected From: is in UI:To
- \* User's locale (lang, TZ) leaks in quoted body
- \* Header fields not protected (and in particular, Subject is not obscured) by default

### [A.4.](#) Problems Reviewing signed-only Messages in List View

- \* Unprotected Subject, Date, From, To are visible
- \* Threading is not visible

#### [A.5.](#) Problems when Rendering a signed-only Message

- \* Unprotected Subject is visible
- \* Protected subject (on its own) is visible in the body
- \* Protected subject, date, from, to visible in the body
- \* User interaction needed to view whole message
- \* User interaction needed to view message body
- \* User interaction needed to view protected subject
- \* Impossible to view protected subject
- \* Nuisance alarms during user interaction
- \* Impossible to view message body
- \* Appears as a forwarded message
- \* Appears as an attachment
- \* Security indicators not visible
- \* Security indicators do not identify protection status of header fields
- \* User has multiple different methods to Reply: (e.g. reply to outer, reply to inner)
- \* Header fields in body render with local header fields (e.g. showing "Betreff" instead of "Subject") and dates (TZ, locale)

#### [A.6.](#) Problems when Replying to a signed-only Message

This uses the same use case(s) and shorthand as [Appendix A.3.](#)

- \* Unprotected Subject: is in UI:subject
- \* Protected Subject: is quoted in UI:body
- \* Protected Subject: is not anywhere in UI
- \* Message body is not visible/quoted in UI:body

- \* User cannot reply while viewing protected message

- \* Unprotected From: is in UI:To
- \* User's locale (lang, TZ) leaks in quoted body

## [Appendix B](#). Test Vectors

This section contains sample messages using the different schemes described in this document. Each sample contains a MIME object, a textual and diagrammatic view of its structure, and examples of how an MUA might render it.

The cryptographic protections used in this document use the S/MIME standard, and keying material and certificates come from [\[I-D.ietf-lamps-samples\]](#).

These messages should be accessible to any IMAP client at `imap://bob@header-protection.cmrg.net/` (any password should authenticate to this read-only IMAP mailbox).

You can also download copies of these test vectors separately at <https://header-protection.cmrg.net>.

If any of the messages downloaded differ from those offered here, this document is the canonical source.

### [B.1](#). Baseline Messages

These messages offer no header protection at all, and can be used as a baseline. They are provided in this document as a counterexample. An MUA implementer can use these messages to verify that the reported cryptographic summary of the message indicates no header protection.

#### [B.1.1](#). No cryptographic protections over a simple message

This message uses no cryptographic protection at all. Its body is a text/plain message.

It has the following structure:

└ text/plain 152 bytes

Its contents are:

```
MIME-Version: 1.0
Content-Type: text/plain; charset="utf-8"
Content-Transfer-Encoding: 7bit
Subject: no-crypto
Message-ID: <no-crypto@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:00:02 -0500
```

This is the no-crypto message.

This message uses no cryptographic protection at all. Its body is a text/plain message.

--

Alice  
alice@smime.example

#### [B.1.2.](#) S/MIME signed-only signedData over a simple message, No Header Protection

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a text/plain message. It uses no header protection.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 3852 bytes
  ↓ (unwraps to)
  └ text/plain 204 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="signed-data"  
Subject: smime-one-part  
Message-ID: <smime-one-part@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:01:02 -0500

MIILFwYJKoZIhvcNAQcCoIILCDECCwQCAQExDTALBgIghkgBZQMEAgEwggFABgkqhkiG9w0BBwGgggExBIIBLU1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6IHRleHQvcGxhaW47IGNoYXJzZXQ9InV0Zi04Ig0KQ29udGVudC1UcmFuc2Zlci1FbmNvZGluZzogN2JpdA0KDQpUaGlzIGlzIHRoZSBzbWltZS1vbWUtcGFydCBtZXNzYWdlLg0KDQpUaGlzIGlzIGEgc2lnbmVklW9ubHkgUy9NSU1FIG1lc3NhZ2UgdmIhIFBLQ1MjNyBzaWduZWREYXRhLiAgVGhlbDQpwYXlsb2FkIGlzIGEgdGV4dC9wbGFpb2BtZXNzYWdlLiBJdCB1c2VzIG5vIGhlyWRLciBwcm90ZWN0aW9uLg0KDQotLSAN

CkFsaWNlDQphbGljZUBzbWltZS5leGFtcGxldQqgggemMIIDzzCCAregAwIBAgITDy0lvRE5l0rOQLSHoe49NAaKtDANBgkqhkiG9w0BAQ0FADBVMQ0wCwYDVQQKEWRJRVRGMREwDwYDVQQLEWhMQU1QUyBXRzExMC8GA1UEAxMoU2FtcGxliExBTvBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eTagFw0xOTExMjAwNjU0MThaGA8yMDUyMDkyNzA2NTQxOFowOzENMAsGA1UEChMESUVURjERMA8GA1UECXMITEFNUFMgV0cxZzAVBgNVBAMTDkFsaWNlIExvdmVsYWNlMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmPUp+ovBouOP6AFQJ+RpwP0DxxzY60n1lJ53pTeNSiJlWkwTw/cxQq0t4uD2vWYB8gOUH/CVt2Zp1c+auzPKJ2Zu5mY6kHm+hVB+IthjLeI7Htg6rNeuXq50/TuTSxX5R1I1EXGt8p6hAQVeA5oZ2afHg4b97enV8gozR0/Nkug4AkXmbk7THNc8vvjMUJanZ/VmS4TgDqXjWShplcI3lcVvBZMswt41/0HJvmswqps6oQcAx3Weag0yCNj1V9V9yu/3DjcYbwW2lJf5NbmHBm1LY4X5chWfNEbkN6hQury/zxnlsukgn+fHbqvWdhJLAgFpW/jA/EB/WI+whUpqtQIDAQABo4GvMIGsMAwGA1UdEwEB/wQCMAAwFwYDVR0gBBawDjAMBgpghkgBZQMCATABMB4GA1UdEQQXMBWBE2FsaWNlQHNTaW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYIKwYBBQUHAWQwDgYDVR0PAQH/BAQDAgUgMB0GA1UdDgQWBBSiU0HVRDyAKRV8ASPw546vzfN3DzAfBgNVHSMEGDAWgBSRMI58BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG9w0BAQ0FAAOCAQEAgUl4oJyxMpwWpAylOvK6NEbMl1gD5H14EC4Muxq1u0q2XgXOSBHI6DfX/4LDsfx7fSIus8gWVY3WqMeu0A7IizkBD+GDEu8uKveERRXZncxGwy2MfbH1Ib3U8QzTjqB8+dz2AwYeMxODWq9opwtA/lT0kRg8uuivZfg/m5fFo/QshlHNaaTDVEXsU4Ps98Hm/3gznbvhdjFbZbi4oZ3tAadRlE5K9JiQaJY0nUmGpfb8PPwDR6chMZeegSQAW++0IKqHrg/WEh4yiuPfqmAvX2hZkPpivNJYdTPUXTS07K459CyqbqG+sN0o2kc1nTXl85RHNrVKQK+L0YWY1Q+hWDCCA88wggK3oAMCAQICEzdBBXntdX9CqaJc0vT4as6aqdcwDQYJKoZIhvcNAQENBQAuVTENMAsGA1UEChMESUVURjERMA8GA1UECXMITEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlnaWNhdGlvb2B1bWltZS1vbWUtcGFydCBtZXNzYWdlLiBJdCB1c2VzIG5vIGhlyWRLciBwcm90ZWN0aW9uLg0KDQotLSANMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoTBELFVEYx

ETAPBgNVBAStCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBALT0iehY0BY+TZp/T5K2KNI05Hwr+E3wP6XTvyi6WWyTgBK9LC0wI2juwdRrjFBSXkk7pWpjXwsA3A5G0tz0FpfgyC70xsVcF7q4WHWZWleYXFkLQHJD73nQwXP968+A/3rBX7Ph00DBbZnfit0LPgPEwjTtdg0VQQ6Wz+CRQ/YbHPKaw7aRphZ063dKvIKp4cQVtkWQH6syTjGsgkLcLNau5LZDQUdsGV+SAo3nBdWCRYV+I65x8Kf4hCxqqmjV3d/2NKRu0BXnDe/N+iDz3X0zEoj0fqXgq4SWcC0nsG1lyyXt1TL270I6ATKRGJWiQVCCpDtc0NT6vdJ45bCSzsCAwEA Aa0BrzCBrdAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIGwDAdBgNVHQ4EFgQUu/bMsi0dBhIcl64papAQ0yBmZnMwHwYDVR0jBBgwFoAUkTC0fAcXDKfxCSHlNhpHGH29FkwDQYJKoZIhvcNAQENBQADggEBAH0JojanzqmgasN3/gqSQ4cbbmdj/R40BEPr+gXT+xiidfZ2iLNwYyTneuk6ACHwKfnNvOFb8lV1iffRtF/KtmVEDMR/sYeqAH83KM5p3el2lVh40HhyI0qNuz5oShNaACSioQ23WxHGVy9vsdVfnbhsplrWg9NQ2WbpCmK+2oMh2oYl0Z/wvXMT9cG6jbMvcdH4z0IOvg6mrYkKTM/RCGnumghxwYToj10yD5Gs4D2IJCw+fX50Dxh52MbNRYXTus2ZPRPM8JXNQC4GWv4km3M4rKnJDd6hnoQ9rNeozIcBVyybQYjfrgg4DRvw9Ksk220H4ConlB8f7R7s1LM2cSYxggIAMIIB/AIBATBsMFuxDTALBgNVBAOTBELFVEYxETAPBgNVBAStCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlnBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhM3QQV57XV/QqmiXDr0+GrOmqnXMASGCWCGSAFlAwQCAaBpMBGCSqGSIb3DQEJAZELBgkqhkiG9w0BBwEwHAYJKoZIhvcNAQkFMQ8XDTIxMDIyMDEwMlowLwYJKoZIhvcNAQkEMSIEIESMi+9/LULdfGjj+6U50VNLfxbzvyVJ0wzwnTS114DyMA0GCSqGSIb3DQEBAQUABIIBACJHeayBUllC4GdcgdojTUjoeIy6UIbrSg/aKZgAkCB8Dwq0hdU10qiun6WKI/TxM5izpRvL

UsNBGMqknPBMFhvwX6KCrwFk0p0j5Y5DZqX30deiQiGTUv3NiwZGTrKJ3JkyymFOHGbe5Thrq3inRLVfilEuIZewaJsnJhKfnEq9fS09ictJ5olPDAH6mZbW6hpYmU3FkBk2qJNqJX6bo60rCogu3wXDj0wxnqEXmeNDH5/+L9UVZur+EWzviUc8Ldd/kP3LD007ivs10bAWe8Tbw7NjuP8ZlVvzcj3nXWzZzxh2ymDIOvyJA+t0LHQvsN/fbdWfC6Pm51fEkabmw=

### [B.1.3.](#) S/MIME signed-only multipart/signed over a simple message, No Header Protection

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses no header protection.

It has the following structure:

- └ multipart/signed 4156 bytes
  - └ text/plain 224 bytes
  - └ application/pkcs7-signature [smime.p7s] 3429 bytes

Its contents are:

MIME-Version: 1.0  
Content-Type: multipart/signed;  
    protocol="application/pkcs7-signature"; boundary="76c";  
    micalg="sha-256"  
Subject: smime-multipart  
Message-ID: <smime-multipart@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:02:02 -0500

--76c

MIME-Version: 1.0  
Content-Type: text/plain; charset="utf-8"  
Content-Transfer-Encoding: 7bit

This is the smime-multipart message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses no header protection.

--

Alice  
alice@smime.example

--76c

Content-Transfer-Encoding: base64

Content-Type: application/pkcs7-signature; name="smime.p7s"

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#### B.1.4. S/MIME encrypted and signed over a simple message, No Header Protection

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses no header protection.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 6720 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 3960 bytes
    ↓ (unwraps to)
    └ text/plain 239 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: smime-enc-signed  
Message-ID: <smime-enc-signed@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:03:02 -0500

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Gillmor, et al.

Expires 8 September 2022

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Internet-Draft

Header Protection S/MIME

March 2022

#### [B.1.5.](#) No cryptographic protections over a complex message

This message uses no cryptographic protection at all. Its body is a multipart/alternative message with an inline image/png attachment.

It has the following structure:

```
├─ multipart/mixed 1371 bytes
│   └─ multipart/alternative 794 bytes
│       ├── text/plain 206 bytes
│       └─ text/html 304 bytes
└─ image/png inline 232 bytes
```

Its contents are:

```
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="428"
Subject: no-crypto-complex
Message-ID: <no-crypto-complex@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:00:02 -0500
```

--428

```
MIME-Version: 1.0
Content-Type: multipart/alternative; boundary="db9"
```

--db9

```
Content-Type: text/plain; charset="us-ascii"
MIME-Version: 1.0
Content-Transfer-Encoding: 7bit
```

This is the no-crypto-complex message.

This message uses no cryptographic protection at all. Its body is a multipart/alternative message with an inline image/png attachment.

--

Alice

alice@smime.example

--db9

Content-Type: text/html; charset="us-ascii"

MIME-Version: 1.0

Content-Transfer-Encoding: 7bit

<html><head><title></title></head><body>

<p>This is the <b>no-crypto-complex</b> message.</p>

<p>This message uses no cryptographic protection at all. Its body is a

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multipart/alternative message with an inline image/png attachment.</p>

<p><tt>-- <br/>Alice<br/>alice@smime.example</tt></p></body></html>

--db9--

--428

Content-Type: image/png

Content-Transfer-Encoding: base64

Content-Disposition: inline

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcELEQVR42uVT0xbA  
MAGS739nO3TpRw20dqpbfARQEj0ywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ  
sgrzfcqVMpL2jo0447gYDpeArk+OnJHkIhAftPRicihAf5YJrw7vjv0ZWRWM/uli  
vdPf1QZ2kDD9xppd8wAAAABJRU5ErkJggg==

--428--

#### [B.1.6.](#) S/MIME signed-only signedData over a complex message, No Header Protection

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses no header protection.

It has the following structure:

└ application/pkcs7-mime [smime.p7m] 5249 bytes

```

↓ (unwraps to)
├── multipart/mixed 1288 bytes
│   ├── multipart/alternative 882 bytes
│   │   ├── text/plain 258 bytes
│   │   ├── text/html 353 bytes
│   │   └── image/png inline 236 bytes

```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
    smime-type="signed-data"
Subject: smime-one-part-complex
Message-ID: <smime-one-part-complex@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:01:02 -0500
```

MIIPHwYJKoZiHvcNAQcCoIIPEDCCDwwCAQExDTALBg1ghkgBZQMEAgEwggVIBgkqhkiG9w0BBwGgggU5BIIFNU1JTUUtVmVyc2l1b2JogMS4wDQpDb250ZW50LVR5cGU6IG11bHRpcGFydC9taXh1ZDsgYm91bmRhcnc9IjExMCINCg0KLS0xMTANck1JTUUtVmVyc2l1b2JogMS4wDQpDb250ZW50LVR5cGU6IG11bHRpcGFydC9hbHR1cm5hdG12

ZTsgYm91bmRhcnk9IjE5MyINCg0KLS0xOTMNCkNvb nRlbnQtVHlwZTogdGV4dC9w  
bGFpbjsGyY2hhcnNldD0idXMtYXNjaWkiDQpNSU1FLVZlcnNpb246IDEuMA0KQ29u  
dGVudC1UcmFuc2Zlci1FbmNvZGluZzZogN2JpdA0KDQpUaGlzIGlzIHRoZSBzbWlt  
ZS1vbmUtcGFydC1jb21wbGV4IG1lc3NhZ2UuDQoNCiRo aXMgaXMgYSBzaWduZWQtb25seSBTL01JTUUGbWVzc2FnZSB2aWEgUEtDUyM3IHNPZ25lZERhdGEuICBUaGUN  
CnBheWxvYWQgaXMgYSBtdWx0aXBhcnQvYX0ZXJuYXRpd mUgbWVzc2FnZSB3aXR0  
IGFuIGlubGluZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMGbm8gaGVh  
ZGVyIHByb3RlY3Rpb24uDQoNCi0tIA0KQWxpY2UNCmFsaWNlQHNTaW1lLmV4YW1w  
bGUNCi0tMTkzDQpDb250ZW50LVR5cGU6IHRleHQuaHRtbDsgY2hhcnNldD0idXMt  
YXNjaWkiDQpNSU1FLVZlcnNpb246IDEuMA0KQ29udGVudC1UcmFuc2Zlci1FbmNv  
ZGluZzZogN2JpdA0KDQo8aHRtbD48aGVhZD48dGlbGU+PC90aXR sZT48L2hlYWQ+  
PGJvZHK+DQo8cD5UaGlzIGlzIHRoZSA8Yj5zbWltZS1vbmUtcGFydC1jb21wbGV4  
PC9iPiBtZXNzYWdlLlJwvvcD4NCjxwPlRo aXMgaXMgYSBzaWduZWQtb25seSBTL01J  
TUUGbWVzc2FnZSB2aWEgUEtDUyM3IHNPZ25lZERhdGEuICBUaGUN CnBheWxvYWQg  
aXMgYSBtdWx0aXBhcnQvYX0ZXJuYXRpd mUgbWVzc2FnZSB3aXR0IGFuIGlubGlu  
ZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMGbm8gaGVhZGVyIHByb3Rl  
Y3Rpb24uPC9wPg0KPHA+PHR0Pi0tIDxic i8+QWxpY2U8YnIvPmFsaWNlQHNTaW1l  
LmV4YW1w bGU8L3R0PjwvvcD48L2JvZHK+PC9odG1sPg0KLS0xOTMtLQ0KDQotLTEx  
MA0KQ29udGVudC1UeXB0iBpbWFnZS9wbmcNCkNvb nRlbnQtVHJhbnNmZXItRW5i

b2Rpbmc6IGJhc2U2NA0KQ29udGVudC1EaXNwb3NpdGlvbjogaW5saW5lDQoNCmlW  
Qk9SdzBLR2dvQUFBQU5TVWhFVWdBQUFCUUFBUFBVQ0FZQUFBQ05pUjBOQUFBQWNF  
bEVRVLI0MnVWVE94YkENCk1BZ1M3MzluTzNUcFJ3MjBkcXB1ZkFSUUVqT3l3aXdZ  
bkN0a0RLbmJjTGs2NnNxbFQrenQ5Y2lka0UrNkt3a1oNCnNncnmpY3FWTXBMMmpv  
MDQ0N2dZRHB1QXJrK09uSkhrSWhBZlRQumljaWhBZjVZSnJ3N3ZqdjBaV1JXTS91  
bGkNCnZkUGYxUVoya0REOXhwcGQ4d0FBQUFCSLJVNuvYa0pnZ2c9PQ0KDQotLTEx  
MC0tDQqgggemMIIDzzCCAreAwIBAgITDy0lvRE5l0rOQlSHoe49NAaKtDANBgkq  
hkiG9w0BAQ0FADBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLewhMQU1QUyBXRzEx  
MC8GA1UEAxMoU2FtcGx1IEExBTBVTIFJFTQSBdZXJ0aWZpY2F0aW9uIEF1dGhvcml0  
eTA9Fw0xOTExMjAwNjU0MThaGA8yMDUyMDkyNzA2NTQxOFowOzENMA5GA1UEChME  
SUVURjERMA8GA1UECXMITEFNUFMgV0cxZzAVBgNVBAMTDkFsaWN1IEExvdmVsYWNl  
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmPUp+ovBou0P6AFQJ+Rp  
wp0DxxzY60n1lJ53pTeNSiJlWkwtw/cxQq0t4uD2vWYB8g0UH/Cvt2Zp1c+auzPK  
J2Zu5mY6kHm+hVB+IthjLeI7Htg6rNeuXq50/TuTSxX5R1I1EXGt8p6hAQVeA5oZ  
2afHg4b97enV8gozR0/Nkug4AkXmbk7THNc8vvjMUJanZ/VmS4TgDqXjWShplcI3  
lcvvBZMswt41/0HJvmswqpS6oQcAx3Weag0yCNj1V9V9yu/3DjcYbww2lJf5NbMH  
bM1LY4X5chwFNEbkN6hQury/zxnlsukgn+fHbqvDhJLAgFpW/jA/EB/WI+whUpq  
tQIDAQABo4GvMIGsMAwGA1UdEwEB/wQCMAAwFwYDVR0gBBawDjAMBgpghkgBZQMC  
ATABMB4GA1UdEQQXMBWBE2FsaWNlQHNTaW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYI  
KwYBBQUHAWQwDgYDVR0PAQH/BAQDAgUGMB0GA1UdDgQWBBSiU0HVRDyAKRV8ASpW  
546vzfN3DzAfBgNVHSMEGDAWgBSRMI58BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG  
9w0BAQ0FAAOCAQEAgUl4oJyxMpwWpAyl0vK6NEbMl1gD5H14EC4Muxq1u0q2XgX0  
SBHI6DfX/4LDsfX7fSIus8gWVY3WqMeu0A7IizkBD+GDEu8uKveERRXZncxGwy2M  
fbH1Ib3U8QzTjqB8+dz2AwYeMxODWq9opwtA/LT0kRg8uuivZfg/m5fFo/QshLHN  
aaTDVEXsU4Ps98Hm/3gznbvhdjFbZbi4oZ3tAadRlE5K9JiQaJYOnUmGpfB8PPwD  
R6chMZeegSQAW++0IKqHrg/WEh4yiuPfpmAvX2hZkPpivNJYdTPUXTS07K459Cyq  
bqG+sN0o2kc1nTXl85RHNrVKQK+L0YWY1Q+hWDCCA88wggK3oAMCAQICEzdBBXnt  
dX9CqaJc0vT4as6aqdcwDQYJKoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjER  
MA8GA1UECXMITEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2Vy

dGlmawNhdGlvbiBBdXRob3JpdHkwIBcNMtKxMTIwMDY1NDE4WhgPMjA1MjA5Mjcw  
NjU0MThaMDsxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExBTBVTIFdHMRcwFQYD  
VQQDEw5BbGljZSBMb3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoC  
ggEBALT0iehY0BY+TZp/T5K2KNI05Hwr+E3wP6XTvyi6WWyTgBK9LC0wI2juwdRr  
jFBSXkk7pWpjXwsA3A5G0tz0FpfgyC70xsVcF7q4WHWZWleYXFKlQHJD73nQwXP9  
68+A/3rBX7Ph00DBbZnfit0LPgPEwjTtdg0VQQ6Wz+CRQ/YbHPKaw7aRphZ063dK  
vIKp4cQVtkWQH6syTjGsgkLcLNau5LZDQUDsGV+SAo3nBdWCRYV+I65x8Kf4hCx  
qqmjV3d/2NKRu0BXnDe/N+iDz3X0zEoj0fqXgq4SWcC0nsG1lyyXt1TL270I6ATK  
RGJWiQVCCpDtc0NT6vdJ45bCSzsCAwEAAaOBrzCBrdAMBgNVHRMBAf8EAjAAMBcG  
A1UdIAQQMA4wDAYKYIZIAWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5l  
eGFtcGx1MBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIGwDAdBgNV  
HQ4EFgQUu/bMsi0dBhIcl64papAQ0yBmZnMwHwYDVR0jBBgwFoAUkTC0fAcXDKfx



CShlNhpnHGh29FkwDQYJKoZIhvcNAQENBQADggEBAH0JoJanzqmgaSN3/gqSQ4cb  
bmdj/R40BEPr+gXT+xiidfZ2iLNwYyTneuK6AChwKfnNvOFb8lV1iffRTF/KtmVE  
DMR/sYeqAH83KM5p3el2lVh40HhyI0qNuz5oShNaACSioQ23WxHGVy9vsdVfnbhs  
plrWg9NQ2WbpCmK+2oMh2oYl0Z/wvXMt9cG6jbMvcdH4z0IOvg6mrYkKTM/RCGnu  
mghxwYToj10yD5Gs4D2IJCw+fX5ODxh52MbNRYXTus2ZPRPM8JXNQC4GWv4km3M4  
rKnJDd6hnoQ9rNeozIcBVyybQYjfrgg4DRvw9Ksk220H4ConlB8f7R7s1LM2cSYx  
ggIAMIIB/AIBATBsMFUxDtALBgNVBAoTBElFVEYxETAPBgNVBAStCExBTVBTIFdH  
MTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9y  
aXR5AhM3QV57XV/QqmiXDr0+GrOmqnXMA5GCWCGSAFlAwQCAaBpMBGCSqGSIB3  
DQEJAZELBgkqhkiG9w0BBwEwHAYJKoZIhvcNAQkFMQ8XDTIxMDIyMDEwMDEwLWYy  
LwYJKoZIhvcNAQkEMSIEIAiYlRaTjUNCbHnrieg64m3mMEMTRF8kqt5E8+ogUh5/  
MA0GCSqGSIB3DQEBAQUABIIBAILQrmFl9ls0ehRVddBjQESh5VnT+NxYWjofr2i0  
w50oB4RU3+6bPs2i5Y+IZvbnQTKfux+L/Rmy+cK5tlK8J9taLXm3/mJO/57tW+Cl  
E9WSBFb1Ik29FhbTuTbrcSaE6Dr5zGwZBmlkcb3rx+AdYM8PMAhDd+ESwYwyjWk4  
A7zRNEA1pD4XZdiz0a/kULobW9W30KaQdJANQG0CX23puEW+wk9hzuuWX+IXeLwh  
4R1kXSigeWxlu44jrBG0zkr/UjonxvpjBzyvLS6ltj0HekR0zHy9tXEHyeP6B0zC  
kWKI9KZRyeZenYIOJRgqicDLdDgrZN5AoQqE+rBlK5i82l0=

**B.1.7. S/MIME signed-only multipart/signed over a complex message, No Header Protection**

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses no header protection.

It has the following structure:

```
├─ multipart/signed 5199 bytes
│   └─ multipart/mixed 1344 bytes
│       └─ multipart/alternative 938 bytes
│           ├── text/plain 278 bytes
│           ├── text/html 376 bytes
│           └─ image/png inline 232 bytes
└─ application/pkcs7-signature [smime.p7s] 3429 bytes
```

Its contents are:

MIME-Version: 1.0

Content-Type: multipart/signed;

protocol="application/pkcs7-signature"; boundary="e18";

micalg="sha-256"

Subject: smime-multipart-complex

Message-ID: <smime-multipart-complex@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:02:02 -0500

--e18  
MIME-Version: 1.0  
Content-Type: multipart/mixed; boundary="831"

--831  
MIME-Version: 1.0  
Content-Type: multipart/alternative; boundary="a1e"

--a1e  
Content-Type: text/plain; charset="us-ascii"  
MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit

This is the smime-multipart-complex message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses no header protection.

--  
Alice  
alice@smime.example  
--a1e  
Content-Type: text/html; charset="us-ascii"  
MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit

```
<html><head><title></title></head><body>  
<p>This is the <b>smime-multipart-complex</b> message.</p>  
<p>This is a signed-only S/MIME message via PKCS#7 detached signature  
(multipart/signed). The payload is a multipart/alternative message  
with an inline image/png attachment. It uses no header protection.</p>  
<p><tt>-- <br/>Alice<br/>alice@smime.example</tt></p></body></html>  
--a1e--
```

--831  
Content-Type: image/png  
Content-Transfer-Encoding: base64

Content-Disposition: inline

iVBORw0KGgoAAAANSUgAAABQAAAAUCAyAAACNiR0NAAAAcELEQVR42uVT0xbAMAgS739n03TPRw20dqpbfARQEj0ywiwYnCTkDKnbcLk66sqlT+zt9cidkE+6KwkZsgrzfcqVMpL2jo0447gYDpeArk+OnJHkIhAfTPRicIhAf5YJrw7vjv0ZWRWM/ulivdPf1QZ2kDD9xppd8wAAAABJRu5ErkJggg==

--831--

--e18

Content-Transfer-Encoding: base64

Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCc0CAQExDTALBgIghkgBZQMEAgEwCwYJKoZIhvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJKoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGhmaWNhdGlvb1BbdXR0b3JpdHkwIBcNMTkxMTIwMDY1NDE4WHgPMjA1MjA5MjcwNjU0MThaMDsxDALBgNVBAOTBElFVEYxETAPBgNVBAsTCExBTvBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBABJqVKfqLwaLjj+gBUCfkacKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrszyidmbuZmOpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0aGdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXCN5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWzB2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVKaruUCAwEAAoBrzCBrdAMBgnVHRMBAf8EAJAAMBcGA1UdIAQQMA4wDAYKYZIAWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj80eOr83zdw8wHwYDVR0jBBgwFoAUKTC0fAcXDKfxCSHlnhpnHGh29FkwDQYJKoZIhvcNAQENBQADggEBAIFJeKCsTKcFqQMPTryujRGzJdYA+R9eBAuDLsatbtKtl4FzkgRyOg31/+Cw7H8e30iLrPIfLWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMtjH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZRzWmkw1RF7F0D7Pfb5v94M5274XYxW2W4uKgd7QGnUZROsvSYKgiWDp1JhqXwfdZ8A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQsqm6hvrDTqNpHNZ015f0URza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV57XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBAQUAMFUDALBgNVBAOTBElFVEYxETAPBgNVBAsTCExBTvBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIEIcnRpbZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUGA1UEAxMOQWxpY2UgTG92ZWxhY2UwgGEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQC09InoWDgWPK2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHua4xQUl5J06VqY18LANwORjrc9BaX4MguZsbFXBe6uFh1mVpXmFxSpUBYq+950MFz/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2GxzYms02kaYWTut3SryCqeHEFBzFkB4urMk4xrIJC3CzWruS2Q0FHBBlfkgKN5wXVgkWFfi0ucfCn+IQsaqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcs17dUy9u9C0gEyKriVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIwADAXBgNVHSAEEDAOMAawGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETYWxpY2VAc21pbWUuZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD

Internet-Draft

Header Protection S/MIME

March 2022

```

VR00BBYEFLv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFWyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBAQUAA4IBAQBziaI2p86poGkjD/4Kkk0H
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr40pq2JckzP0Qhp
7poIccGE6I9Tsg+Rr0A9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQMLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxliExBTBTBTFJTSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cm10eQITN0EFee11f0Kpolw69Phqzppp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzAyMDJa
MC8GCSqGSIb3DQEJBDEiBCDXOvk8vYdge4ktwwFa4GFP+Zxia/eTOacb5ZgEXQA7
WjANBgkqhkiG9w0BAQEFAASCAQAIBfufI8gxAWPFjnahNo6LRRGWj0U1S4GkRl6h
LCNh5x49ns9BM51cZp+s5KhQSxhFdmuru+wCwgrK7KjzckAnizh70/dEYJmsjSZl
zmLEGmtQ+q9MoyydZD9s2l9891WDjsCFjVIIhRkLTI7Zeh6+wQpGKDbv0MoYQ95
a9HPz6DuuCjCTCv+rUE0Ays4X+dQsgDx3hsSITVoKDR11kHVmZnjC4Byce6HY0Gn
cEg/VqBGK4R70/46XTk/EgLPsnSPLPfc8Pc1kw6yyF+QNYLV4tKvOKRvNJGf+Pjy
GvJIthBGOKFb0tWPPY+nFTMT+aNODuyAVQUmlbQIvz0/WXvU

```

--e18--

#### [B.1.8.](#) S/MIME encrypted and signed over a complex message, No Header Protection

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses no header protection.

It has the following structure:

```

└─ application/pkcs7-mime [smime.p7m] 8690 bytes
  └─ (decrypts to)
    └─ application/pkcs7-mime [smime.p7m] 5426 bytes
      └─ (unwraps to)
        └─ multipart/mixed 1356 bytes
          └─ multipart/alternative 950 bytes
            └─ text/plain 293 bytes
              └─ text/html 388 bytes
                └─ image/png inline 236 bytes

```

Its contents are:

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Header Protection S/MIME

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Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: smime-enc-signed-complex  
Message-ID: <smime-enc-signed-complex@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:03:02 -0500

MIIZDAYJKoZIhvcNAQcDoIIY/TCCGPkCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV  
BAoTBELFVEYxETAPBgNVBAsTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFN  
UFMgUlnBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00  
Boq0MA0GCSqGSIb3DQEBAQUABIIBAIGYWhyOEdeaxA1hlsqTJL/nwL8aIuFtQBnq  
8aptWsaRxbkwfd639JspX9JZhc4gu50hiKu1HdJ2+IL7vvPRB49SfqicSt+ImD3  
syFxHjbMJSFDNNukyut/SYV+DAHbvGiGxB0vCT8iW+qbKgwvQYcm2Kcs0UYV7ek  
NXA7wkNjIygcyRSbg7Xdhv9HcGGtIshTBvwS9DaYwmjo/8IlrXfeIusKU7dhZgMK  
bVVbotXAylbEFH6vpDFWK5pc+DPgVPFe8iA8z02k8HdtXEM44g++0/chZAiqe8uw  
UARmERg+5Y+2dROAVHRWFvlow6qWw71jBmtf55abK6jJFhSIzmowggGEAgEAMGww  
VTENMAsgA1UEChMESUVURjERMA8GA1UECXMITEFNUFMgV0cxMTAvBgNVBAMTKFNh  
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEZB8R0APhiY6  
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAB9sGmAYY1DHhoMQbd734joYE  
SjbvKHEPy0AlJI7FfGdAr4I+dmkYeBuvZVM1YWhitejpVALurNbbLkOEj+yPhGbTG  
nxBGt08KsSGKCM1bLIY9MpkbsdUs0rSkPs33cYeRLJwGTzAsTSy0txkCETlKQBgK  
0JGNQHIu8gvPjyMrLRI5xHGVjvbdz0LiWeQPJmoqBFy053sliYgWGizmeqjVUSc9  
LeQ1h0kHl+vF0QQxAqIl9+SpjRTlFe3MXdq3gmvwgkYPelF48YaBst45yyJh57+z  
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Fd4GCSqGSIb3DQEHATAdbGlgkGBZQMEAEIEN/jbIuyBiQPvx9QS9tgtISAgHwW  
/W8bWpUqIZAatmwlv5kmA9az3Z9YUJnqm2X8mh1M0+UrRCcq/uk04cXYQaF0iqS+  
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p9atNXNLr7tSxVec1j/uuW8cwTToPi7U/kHFCdGQt+YwMoUhd4gVp6lxWtgeNUE+  
RNr/vN/hPSwXyWR/Wck4Vlc9AjlGwds4m4R9MzGHaaFWjOSGbkhm8dN/e0s409ze  
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tTPdcv2KxP1yxflB5xF/jVxaFXlsRr7ZW3tPrWuR/oGhSn5DM6Ruqg0zN7RoMAuu  
9QxQRWS8eyw5VFxThQ/5pWVos2xwF3WtKVfuOXbhhKLwwwcZpiW32UvwnLG6QdLp  
2FdmgD/MJmKGH0rB2LyUx6fABS0rOBz7iEe2uwPDTKIyLNj8uH4P9+09IaYnNHbT  
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Rmhtc0gFnpcCQ0iZNNssJDBLZhu1iEGq5Vbm/UXqS11b/vWtBmqrwUoBsrgXvkvx  
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mg0sxcNkGEDPipr8Z+hioT07g1++ZhUbPQSY6biWrQmRemE4nIXisAEXfX5oPtrN  
X9y92vgfUEF9q8c6uiVlh7MMt/U8WyjuoM/pEQRd24sA1n+Hxytq99aStV0DQqg8  
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rIlw6XRj3xix+kYBrDHkzZI8Jp27Z4lbkpcXu9U3i0HP+HPD8T8HepC2n63eQop2  
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XQxhbVD/26zPKilLSYbAs634xeU91PUEDfVYdeA6uMSG05Fn+0D2ldT8vZiE5H2T  
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BeQ7Xx0o/U0aNSXdT88TZ9v9z4VYCLaW2ko+WAd9PrmKLkcdqxmt0WT7z1ii2RG7  
hLOpjKI4FHWFGwtXcx8YnXr4FDr6m87DhiYURQbLSV4iUfBgECFFhVuz4quYIyZn  
yDrMlVJJ15vmZmw0lJKfSjMKyUZTJRPZaqRqjEu1hmLfuTKygTpFHW0Rx8HTkiDE  
wWG4c3Jyh5AMSjYmTnnVgr/fqH1N56k9LD9ydWquMKe0HW3X2bhMQ6M+x03l1b/k  
XUBf7lD2W+u2BJMGDNhvU2aLL42QPQebGjrsb/Dmoq9BtJr1ldrB224aCbaYCSkN  
dsQCCSPLCB/TXJAGoDSznw5f00dG/gsafE0q2SvCrnACoQwkpz8HHYezx1QnV4Bn  
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t1v1dsbI2ikHBvWe0z9f+EsXks1E2h07GyPiK3TgwzVeT+t3z5wA0/39l7qigGZ/  
R6v3e2RhaBu6DSBhUX97hvJgn0rIjdkNv2A380mrW9Xz2ZXJhYkj5Isp5ch5wy8p  
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gbQXVKzi7mFcFyn0R1GgFFldLDLLV9F0b4hXYAgY3KV0qu6hfyrq6zAw8CRAPYkP  
3rhV082VlF0axIUiA/U06vuX0WFzKMKciH8XEDvdPZycExa5HTzr9D7Je89csh5Z  
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05G1Ekiq3VH4NDCgARDCeGFag4oJU6Naw0rKAW3dzZQjZxU0c8a+CdVLV+ZaXYUC  
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OfJZ8vDjzNtrkHFTbix4Vj7bzQFLLfiGl7bP++hN+8ioJDsxob0/DijdcTvdJnzR  
XJRgBH4iEEJrOcleQ5HIq2kLmUoYz+U4YpBVFB0KUyQfheYl689HphhUg2NEs9w/  
6am0jNfHpdUrRuBCHtBLIJySdyexq9Gzy/M5/+j51v29YXCLZo/lu6JpPXv21wGy  
uG/+T5wFKVlcIBVfwgYJJM4Whht7I9S6IAqp35b0hLNTYoyGAqtt0SEENpM5wJKw  
DGLB4vye2vyiK67ZACxcnqUrDePFYRFKUMSj+U/zeB62y/DVmZBkr7XAXiGBKbp  
M5YMTuLmsz6uB2S9Pp1fuiw03qV4myPHlNQMtHZVnn/Fcgo+3rpW1zx3JSX+aMdT  
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oPv6RmpJDvJbh/uriqGZKNI f27t50/IGBBcWRGeMBgqYYkmG4ss6cvbIcBcnyP/D  
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Mn5Pvfv2L+QYi2mpCxAmArsCHVJSysWXJ66Lzps4J0hI2mfxalyK/N+qW8dNrvkJ  
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V1T9QGbP8U2wp6pwVsJAdo4nuH+sn7HUsDxGP0/Zwz65dhSyd7eHLNSfEdxBMFSq  
GyQ/RG03Rxq+sgtAKLjaBlS4Ra7xNLAkdx00dlyciNXPfHubDDhaib7BQE3qG7WY

9JYC9NeBS6qtfn5PBS9xaf5xtHLbIBegz0NRmct2KkamMIQsAJYRvcJ98mMXrFw0  
qpqtQ0KHePJk7CLjUB8oQooWUuD7LGpmeSCnjTUSXqqJiW40ZWX0IWJYGkCE0LuZ  
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1nwrMHbPBzEpEufZjGs8TbN5Ww2CUfuSFBkB+dn7dko0RVppiakygh/OzSiNYp1  
KCNU7RkGV45I+hadL7RU811L5F4Qimo7WQXW6F8fFEakURm4PU2cREpR86dhe/Xt  
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h7V010ozajrZ4VGJVYI6DsBRPfa5DY+l4f/ITDy0Nn9VBmn0lIQhwC1G4l1csAnW  
L4T0bi2glMl3BdafBAR0H7RePm08oohRiV9gB3lm90Xy7t9tyMdmfJSKEExALnc5/  
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R0wTA3fMRH8v9UVQlVcoNBS+FzXPk8wRm4Nbx0zQ/d6BqDeL25dvQw8qy0+CIntR  
cMWV+BG5PIFFmL4N9fqw1iHyK6ccIhp9KpUuVrpTTmmE2DuuJJi000lZU52DzaTg  
GvRuEjZz/TryEYploSpya4iaNzqnaaWd/g4STf5EXzH192QBf7WJoct/EaioK+8T  
hIpyR5qXBx0RK/+lIT2+oOPfDEXX0I5II+0YTDYa+y1uV9qKnN3apBXS+7GLodr  
fj0ABQTpXkglp6d7CTJU5gJlR+xQjk0KMvuQJn1WzeN3pkEFKaC/9SwoL/olvs5+  
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2Mt/UhmLgfrZ6QidZEqi60PcLgNbbYY35VHGgYsHj8c07GYTo3p59lKC6xEotY92  
9MyK0gM8fw3dfAbBPXA4TqyUm6kD1J2Fy1sMMkyfR5WnQDsR+/Vxq5k5bTLJ1ZRF  
8FZHeWv5AIthWp8KknJv9yHpygUWgj1PtFTPI9JfC40I4kTybfGkS67iIB72oojf  
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dAG0tDQCIyVr719e64j4ZbFjMnFE7QA+YJfMaQ1HLXEGQvF9oLA34dN9hiNAh2Ls  
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aNNbLcnfb5l8/7DXgSpiVFncgsLaCZ3iORfXE/IsNX9+R0An0+y+r2mpdtDWg1w  
69g+EMg4dJw8u7pTTW4J47TCAECjF3WVybl8YpvVmgVsrTIL/jDlNWq66JtH2yC7  
Kcc7IF1neMYTpW033hDTKDcY271nz/BhdumwynboWzKTjyNuim6e/OdCK0JHT8YJ  
8icUmzb0i8iYjAwhSqu6t80ZBYIT7oItqzfkQMKKLWwuguJsRa3P60Y9Gg7FUZno  
PXj0CpNyGzY0hg5VVk6FV+thB11MYmlnG16D50UbrH4tgnzkUwpUCMrXLdWr7dfp  
l9u77ICFSiWnIUTtah+s9TUULnBAL1TWyEN6dcqdtT2+HYzDN+FT9+HJsUabDIVP  
9421qkTt5VlCWImXEPdeq4PqfE7LWtEA666xhpgzdnmmE35QHI/por/HS47TLxTV  
38m+Laew31eEWGaiORbPI8XlNZqlfwjv39bpJH9nqMdaeY/kgbFCAsJyuW1nfJ4W  
uITUYsk0Cs9u70BdYYfo0+zdUgem+XM0epL9zH9gsKiJ4gfdv8x0rmcXhIhaA/V  
bRGj9MYxyBbC0RCNCMT10eX/GndLxj9azdHKugZdLzGTA0Dx84xRd9rDW0SxGv1/  
bNVXqDqCaW7BcSi08pAnWlvwQ+m/p2Wxkzi71uxJhhHX7M8/k6mdJmmrB6SRf6S2  
4oc7ojwI6vXTexWry421uQcrQTOMIFutqna5NYRylICu0vm3WdNuRLfN7Lkpafq  
evbT4zaksQ0uDFoXIGIQ8kJ6HTE0A+v33uV7BZfqlo1yIetX1JnToGheZBMc3skU  
pCQjWDeZA6u42Nz+ewytKgYRwr2trDE0bX3xMfH0+/o=

## [B.2.](#) Signed-only Messages

These messages are signed-only, using different schemes of header protection and different S/MIME structure. The use no Header Confidentiality Policy because the hcp is only relevant when a message is encrypted.

### [B.2.1.](#) S/MIME signed-only signedData over a simple message, Wrapped Message

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a text/plain message. It uses the Wrapped Message header protection scheme.



```
└─ application/pkcs7-mime [smime.p7m] 4213 bytes
  ↓ (unwraps to)
  └─ message/rfc822 566 bytes
    └─ text/plain 228 bytes
```

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="signed-data"
Subject: smime-one-part-wrapped
Message-ID: <smime-one-part-wrapped@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:04:02 -0500
```

MIIMIwYJKoZIhvcNAQcCoIIMFDCCDBACAQExDTALBg<sup>l</sup>ghkgBZQMEAgEwggJMBGkqhkiG9w0BBwGgggI9BIICOU1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6IG1lc3NhZ2UvcmluZGlzOjE0IyOyBmb3J3YXJkZWQ9Im5vIgoKDQpNSU1FLVZlcnNpb246IDEuMApDb250ZW50LVR5cGU6IHRleHQvcGxhaW47IGNoYXJzZXQ9InV0Zi04IgpDb250ZW50LVRyYW5zZmVyLUVuY29kaW50iaA3Yml0Cln1YmplY3Q6IHNTaW1lLW9uZS1wYXJ0LXdyYXBwZWQKTWVzc2FnZS1JRDogPHNTaW1lLW9uZS1wYXJ0LXdyYXBwZWRAbGhwLmV4YW1wbGU+CkZyb206IEFsaWNlIDxhbGljZUBzbWltZS5leGFtcGxlPgpUbzogQm9iIDxib2JAc21pbWUuZXhhbXBsZT4KRGF0ZTogU2F0LCAyMCBGZWIGMjAyMSAxMDowNDowMiAtMDUwMAoKVHphcyBpcyB0aGUgc21pbWUtb25lLXBhcnQt d3JhcHBlZCBtZXNzYWdlLlgoKVHphcyBpcyBhIHNTZ25lZC1vbmx5IFMvTUlNRSBtZXNzYWdlIHZpYSBQS0NTIzcg2lnbmVkrGF0YS4gIFRoZQpwYXlsb2FkIGlzIGEg dGV4dC9wbGFpbiBtZXNzYWdlLiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2Ug aGVhZGVyCnByb3RlY3Rpb24gc2NoZW1lLlgoKLS0gCkFsaWNlCmFsaWNlQHNTaW1l LmV4YW1wbGUkoIiHphjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQw DQYJKoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjERMA8GA1UECzMITEFNUFMg V0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1OUyBSU0EgQ2VydGlnaW1lbnNhdGlvbiBDbXR0

b3JpdHkwIBcNMtKxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNV  
BAoTBElFVEYxETAPBgNVBAsTCExBTvBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3Zl  
bGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gB  
UCfkacKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXP  
mrszyidmbuZmOpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEF  
Xg0aGdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41ko  
aZXCN5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX

+TWzB2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iP  
sIVKarUCAwEAAa0BrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZI  
AWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlbMBMGA1UdJQQM  
MAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAWIFIDAdBgNVHQ4EFgQUoLNB1UQ8gCkV  
fAEj80eOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCSHlNhpHGH29FkwDQYJ  
KoZIhvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtK  
tL4FzkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3M  
RsMtjH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0  
LIZRzWmkw1RF7FOD7Pfb5v94M5274XYxW2W4uKGd7QGnUZROsVSyKgiWDp1JhqXw  
fDz8A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyu  
OfQsqm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3  
QQV57XV/QqmiXDr0+GrOmqnXMA0GCSqGSiB3DQEBDQUAMFuxDTALBgNVBAOTBEIf  
VEYxETAPBgNVBAStCEExBTvBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgULNB  
IENlcnRpZmljYXRpb24gQXV0aG9yaXR5MCAxMDQ5MTEyMDA2NTQxOFoYDzIwNTIw  
OTI3MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEWhMQU1QUyBXRzEX  
MBUGA1UEAxMQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSiB3DQEBQUAA4IBDwAw  
ggEKAoIBAQC09InoWDgWpk2af0+StijSN0R8K/hN8D+l078oullsk4ASvSwjsCNo  
7sHUa4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+95  
0MFz/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2Gxzyms02kaYW  
Tut3SryCqeHEFbZfKb4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfi0ucfC  
n+IQsaqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcsl7dUy9u9  
COgEykRiVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIw  
ADAXBgNVHSAEEDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETyWxpY2VAc21p  
bWUuZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAw  
HQYDVR00BBYEFv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwH  
Fwyn8QkoZTYaZxxodvRZMA0GCSqGSiB3DQEBDQUAA4IBAQBziaI2p86poGkjd/4K  
kk0HG25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30Uxf  
yrZlRAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HV  
X524bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfxBuo2zL3HR+M9CDr40pq2JCKzP  
0Qhp7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+  
JJtz0KypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSz  
NnEmMYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEWhMQU1Q  
UyBXRzExMC8GA1UEAxMoU2FtcGxliExBTvBTIFJTSBDZXJ0aWZpY2F0aW9uIEF1  
dGhvcml0eQITN0EFee11f0Kpolw69PhqzpqplzALBglgghkgBZQMEAgGgaTAYBgkq  
hkiG9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSiB3DQEJBTEPFw0yMTAyMjAxNTA0  
MDJhMCA8GCSqGSiB3DQEJBDEiBCCt+Ik56mZTd2mpSg0XM38dS7jM5aLU2FDX9/58  
cga1szANBgkqhkiG9w0BAQEFAASCAQCxKLkx5li140IOch2tcWqcsQilPLgQ30ck  
qhJL2X9/Cl22ib0GNwL8w3qSEBeG1a+WtHw3bSqJx1ciRYcLs16ms23no5QoZ0pU  
fRLmQuTEgObCf+syiTGNWlj8e+2aRVP1L9yEibin6+hFyp4s393zYhdMOPAP2ruI  
lg+BxoWUjXso+8lPgqLawA+9KMI6tQZMnwI9LpGJmZfoSXdHWqWtjdotzZpqsKm  
Ihr8DBKtUetqgZ2zqD03zo3W2L6EmNM05BJUmqwAt/cN+X9kws5dAqtHDQhPNTa1

WUX0oTTkMzn1RAlOxfowEStSnfD00zIqg+L7LgiMw9jhIgP4/uB2

### B.2.2. S/MIME signed-only multipart/signed over a simple message, Wrapped Message

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses the Wrapped Message header protection scheme.

It has the following structure:

```
├─ multipart/signed 4451 bytes
│   └─ message/rfc822 596 bytes
│       └─ text/plain 256 bytes
│           └─ application/pkcs7-signature [smime.p7s] 3429 bytes
```

Its contents are:

```
MIME-Version: 1.0
Content-Type: multipart/signed;
  protocol="application/pkcs7-signature"; boundary="20c";
  micalg="sha-256"
Subject: smime-multipart-wrapped
Message-ID: <smime-multipart-wrapped@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:05:02 -0500
```

--20c

```
MIME-Version: 1.0
Content-Type: message/rfc822; forwarded="no"
```

```
MIME-Version: 1.0
Content-Type: text/plain; charset="utf-8"
Content-Transfer-Encoding: 7bit
Subject: smime-multipart-wrapped
Message-ID: <smime-multipart-wrapped@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:05:02 -0500
```

This is the smime-multipart-wrapped message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses the Wrapped Message header protection scheme.

--

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Alice  
alice@smime.example

--20c  
Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCc0CAQExDTALBgIghkgBZQMEAgEwCwYJKoZI  
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJ  
KoZIhvcNAQENBQAuVTENMA5GA1UEChMESUVURjERMA8GA1UECzMITEFNUFMgV0cx  
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGhmaWNhdGlvbiBBdXRob3Jp  
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAOT  
BELFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj  
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwLjj+gBUCfk  
acKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz  
yidmbuZmOpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0a  
Gdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXC  
N5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz  
B2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK  
arUCAwEAAa0BrzCBrdAMBGNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD  
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG  
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAWIFIDAdBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj  
80eOr83zdw8wHwYDVR0jBBgwFoAUKTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZI  
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMPTryujRGzJdYA+R9eBAuDLsatbtKtl4F  
zkgRy0g31/+Cw7H8e30iLrPIfLWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3MRsMt  
jH2x9SG91PEM046gfPnc9gMGHjMTglqvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR  
zWmkw1RF7F0D7Pfb5v94M5274XYxW2W4uKGd7QGnUZROsvSYkGiWdp1JhqXwFdZ8  
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyufQs  
qm6hvrDTqNpHNZ015f0URza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV5  
7XV/QqmiXDr0+Gr0mqnXMA0GCSqGSIb3DQEBAQUAMFUDTALBgNVBAoTBELFVEYx  
ETAPBgNVBAsTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIEEN  
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3  
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG  
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK  
AoIBAQC09InoWDgWpk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU  
a4xQUl5J06VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFSpUByQ+950MFz  
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2Gxzys02kaYWTut3  
SryCqeHEFbZfKB4urMk4xrIJC3CzWruS2Q0FHBBlfkgKN5wXVgkWFfi0ucfCn+IQ  
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcs17dUy9u9C0gE  
yKriVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIwADAX  
BgNVHSAEEDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETWxpY2VAc21pbWUu  
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBsAwHQYD  
VR00BBYEFLv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJJEwjnwHFwyn

8QkoZTYaZxxodvRZMA0GCSqGSIB3DQEBDQUAA4IBAQBziaI2p86poGkjd/4Kkk0H  
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl  
RAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524  
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLFXBuo2zL3HR+M9CDr40pq2JCkzP0Qhp  
7poIccGE6I9Tsg+Rr0A9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz

OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNTjh+AqJ5QfH+0e7NSzNnEm  
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQMLEwhMQU1QUyBX  
RzExMC8GA1UEAxMoU2FtcGxliExBTBTIFJTSBDZXJ0aWZpY2F0aW9uIEF1dGhv  
cm10eQITN0EFee11f0Kpolw69Phqzpp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG  
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIB3DQEJBTBTEPFw0yMTAyMjAxNTA1MDJa  
MC8GCSqGSIB3DQEJBTBDEiBCCcDIx7wd3VCCz1VBG9nySvUJ/Fhzo26f78EL/UUbj  
jTANBgkqhkiG9w0BAQEFAASCAQBUMGL40IZQmt3Nad/ymEU0Lu3Dgfd/nYKuj6P  
fjKYJFb9UhwtfZK9/WyVtytLsFJMYHZgUSWU3VbHk1L/c00469Rbqo6CqLLRJPK  
uN2Eul2UCa+3ovMIQ8g0NBflXrdfr00VRqvF091hLFkTxLfCDUG8ziRW0LWucgZg  
zkVXqEzvFy0tsSbr3GAY817wWgl1+PTFch04XF+rg7cNysKqGLtjxP9lN3PcURYv  
TmooTPY46kheab7ZAzKqQI6go7somKmMqD7UsctMLSVZo+EX5/N9vq5znn7bfpOE  
Rgd+NZNQD+VYDIOU1FI5ZjyjHpRmcFpywjvHNbTBGLYhv3q4

--20c--

### [B.2.3.](#) S/MIME signed-only signedData over a simple message, Injected Headers

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme.

It has the following structure:

- └ application/pkcs7-mime [smime.p7m] 4185 bytes
  - ↓ (unwraps to)
  - └ text/plain 239 bytes

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="signed-data"  
Subject: smime-one-part-injected  
Message-ID: <smime-one-part-injected@lhp.example>  
From: Alice <alice@smime.example>

To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:06:02 -0500

MIIMDgYJKoZIhvcNAQcCoIIL/zCCC/sCAQExDTALBgIghkgBZQMEAgEwggI3BgkqhkiG9w0BBwGgggIoBIICJE1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVRYYW5zMmVyLUVuY29kaW5nOIA3YmI0DQpTdWJqZWN0OiBzbWltZS1vbmUtcGFydC1pbmplY3RlZA0KTWVzc2FnZS1JRDogPHNtaW1lLW9uZS1wYXJ0LWluamVjdGVkQGxocC5leGFtcGxlPg0KRnJvbTogQWxpY2UgPGFsaWNlQHNTaW1lLmV4YW1wbGU+DQpUbzogQm9iIDxib2JAc21pbWUuZXhhbXBsZT4NckRhdGU6IFNhdCwgMjAgRmViIDIwMjEgMTA6MDY6MDIgLTAA1MDANCKNvbnRlbnQtVHlwZTogdGV4dC9wbGFbjsgY2hhcnNldD0idXRmLTgiOyBwcm90ZWN0ZWQtaGVhZGVycy0idjEiDQoNCiRoaxMgaXMgdGhlIHNtaW1lLW9uZS1wYXJ0LWluamVjdGVkIG1lc3NhZ2UuDQoNCiRoaxMgaXMgYSBz

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Internet-Draft Header Protection S/MIME March 2022

aWduZWQtb25seSBTL01JTUUGbWVzc2FnZSB2aWEgUEtDUyM3IHNPZ25lZERhdGEuICBUaGUNCnBheWxvYWQgaXMgYSB0ZXh0L3BsYWluIG1lc3NhZ2UuIEl0IHVzZXMGdGhlIEluamVjdGVkIEhlyWRlcnMgaGVhZGVyDQpwc90ZWN0aW9uIHNTaWVtZS4NCg0KLS0gDQpBbGljZQ0KYWxpY2VAc21pbWUuZXhhbXBsZQ0KoIIHpiCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJU6HuPTQGirQwDQYJKoZIhvcNAQENBQAwVTENMAAGA1UEChMESUVURjERMA8GA1UECzMITEFNUFmgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmawNhdGlvbiBBdXR0b3JpdHkwIBcNMTEwMDY1NDE4WhgPMjA1MjA5MjcWU0MThaMDsxDTALBgNVBAoTBELFVEYxETAPBgNVBAsTCExBTvBTIFdHMRcwFQYDVQDEw5BbGljZSBMB3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqlWAlj+gBUCfkacKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbmadXPmrszyidmbuZmOpB5voVQfiLYyy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0aGdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXC5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWzB2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVKarUCAwEAAa0BrzCBrDAMBGNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYZIAWUDAgEwATAeBgNVHREEFzAVGRNhBgljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVFAEj80eOr83zdw8wHwYDVR0jBBgwFoAUKTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZIhvcNAQENBQADggEBAIFJeKCCsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtL4FzkgRy0g31/+Cw7H8e30iLrPIFlWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3MRsMtjH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZRzWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQsqm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV57XV/QqmiXDr0+GrOmqnXMA0GCSqGSIB3DQEBDQUAMFUxDTALBgNVBAoTBELFVEYxETAPBgNVBAsTCExBTvBTIFdHMTewLwYDVQDEyhTYW1wbGUgTEFNUFmgUlnBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEWhMQU1QUyBXRzEXMBUGA1UEAxMOQWxpY2UgTG92ZWxh

Y2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQC09InoWDgWPk2af0+S  
tijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHUa4xQUl5J06VqY18LANwORjrc  
9BaX4MguzsbFXBe6uFh1mVpXmFSpUByQ+950MFz/evPgP96wV+z4TtAwW2Z34rT  
iz4DxMI07XYNFUE0ls/gkUP2Gxzys02kaYWTut3SryCqeHEFbZFkB4urMk4xrIJ  
C3CzWruS2Q0FHbBlfkgKN5wXVgkWFfi0ucfCn+IQsaqpo1d3f9jSkbtAV5w3vzfo  
g8919MxKI9H6l4KuElNAtJ7BtZcsl7dUy9u9C0gEyKriVokFQgqQ7XNDU+r3SeOW  
wks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAEEDAOMAwGCmCGSAFl  
AwIBMAEwHgYDVR0RBBCwFYETYWxpY2VAc2lpbWUuZXhhbXBsZTATBgNVHSUEDDAK  
BggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYDVR00BBYEFV2zLIthQYSHJeu  
KWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwnwHFwyn8QkoZTYaZxxodvRZMA0GCSqG  
SIb3DQEBAQUAA4IBAQBziaI2p86poGkjD/4Kkk0HG25nY/0eNARD6/oF0/sYonX2  
doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZlRAzEf7GHqgB/Nyj0ad3pdpVY  
eDh4ciNkKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524bKZa1oPTUNlm6QpivtqDIdqG  
JdGf8L1zLfxBuo2zL3HR+M9CDr40pq2JCKzP0Qhp7poIccGE6I9Tsg+Rr0A9iCQs  
Pn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz0KypyQ3eoZ6EPazXqMyHAVcs  
m0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEmMYICADCCAfwCAQEwbDBVMQ0w  
CwYDVQKKEwRJRVRGMREwDwYDVQQLewhMQU1QUyBXRzExMC8GA1UEAxMoU2FtcGxl  
IExBTBVTIFJTSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eQITN0EFee11f0Kpolw6  
9Phqzppp1zALBglghkgBZQMEAgGgATAYBgkqhkiG9w0BCQMxCwYJKoZIhvcNAQcB

MBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTA2MDJaMC8GCSqGSIb3DQEJBDEiBCA7  
4grfze+Y7DQEGFAYHyvRpNkuuZFR0V+RvSTvu4FGDANBgkqhkiG9w0BAQEFAASC  
AQB1KYVvQNZpe3EKEM0XhJrLJNxnVmZWFCeL5YFeRs08FeIwJkV65YtFJKj0VVy  
qYuZBGz4MsKaddXxAOXI/Q7cJ+70d9i0c1mL3PD2/U6D0wwhNfJoNSK7miYfMASV  
42TMJWt0T10RJnvBitjkTuZDus1tp3xwxbrZTa4pyGaXEhBW/Fc4z6L+z8hpQv/  
+6dw3+ORgfc67VTHVnsVVfb0UPrWvdxFdL5xYdqXxlHdsLMems2ttHHzvjc003Kq  
As0xMHemMpfdL5M69MAjvro0Uv0SXETfQaxca7IKd+9xUNNRretZ9xz2kn2uD+k7  
unTEyVGeHrWmQMw/8MdvEac/

#### [B.2.4.](#) S/MIME signed-only multipart/signed over a simple message, Injected Headers

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses the Injected Headers header protection scheme.

It has the following structure:

- └ multipart/signed 4417 bytes
  - └ text/plain 258 bytes
  - └ application/pkcs7-signature [smime.p7s] 3429 bytes

Its contents are:

MIME-Version: 1.0  
Content-Type: multipart/signed;  
    protocol="application/pkcs7-signature"; boundary="12b";  
    micalg="sha-256"  
Subject: smime-multipart-injected  
Message-ID: <smime-multipart-injected@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:07:02 -0500

--12b

MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit  
Subject: smime-multipart-injected  
Message-ID: <smime-multipart-injected@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:07:02 -0500  
Content-Type: text/plain; charset="utf-8"; protected-headers="v1"

This is the smime-multipart-injected message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a text/plain message. It uses the

Injected Headers header protection scheme.

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Alice  
alice@smime.example

--12b

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCcC0CAQExDTALBgIghkgBZQMEAgEwCwYJKoZI  
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJ  
KoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx  
MTAvBgNVBAMTKFhnbXBsZSBMQUU1QUYBSU0EgQ2VydGhmaWNhdGlvbiBBdXRob3Jp  
dHkwIBcNMTkxMTIwMDY1NDE4WWhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT



BElFVEYxETAPBgNVBAStCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj  
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk  
acKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz  
yidmbuZmOpB5voVQfiLYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0a  
Gdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXC  
N5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz  
B2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK  
arUCAwEAAa0BrzCBrdAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD  
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG  
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAWIFIDAdBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj  
80eOr83zdw8wHwYDVR0jBBgwFoAukTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZI  
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMPTryujRGzJdYA+R9eBAuDLsatbtKt14F  
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3MRsMt  
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR  
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROsvSYkGiWDp1JhqXwfDz8  
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs  
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV5  
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUXDTALBgNVBAoTBElFVEYx  
ETAPBgNVBAStCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIEEN  
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDZiWNTIwOTI3  
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLewhMQU1QUyBXRzEXMBUG  
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK  
AoIBAQC09InoWDgWpk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU  
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz  
/evPgP96wV+z4TtAwW2Z3rTiz4DxMI07XYNFUE0ls/gkUP2Gxzys02kaYWTut3  
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfi0ucfCn+IQ  
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcsl7dUy9u9C0gE  
yKriVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIwADAX  
BgNVHSAEEDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETyWxpY2VAc21pbWUu  
ZXhhbXBzZTATBgNVHSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBsAwHQYD  
VR00BBYEFLv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEWjnwHFWyn  
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjD/4KkkOH  
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl

RAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524  
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLFXBuo2zL3HR+M9CDr40pq2JCkzP0Qhp  
7poIccGE6I9Tsg+Rr0A9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz  
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm  
MYICADCCAfwCAQEwDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLewhMQU1QUyBX  
RzExMC8GA1UEAxMoU2FtcGxlIEExBTvBTIFJtQSBDZXJ0aWZpY2F0aW9uIEF1dGhv  
cm10eQITN0EFee11f0Kpolw69Phqzpp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG  
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCsGSIb3DQEJBTETEPFw0yMTAyMjAxNTA3MDJa

MC8GCSqGSIB3DQEJBDEiBCCXR0Udgr7J+TnI6kw8MpGtWVJPCnoAB+XfkDf78dWi  
cTANBgkqhkiG9w0BAQEFAASCAQCitU3JsEMd9FhqUu87UxYScDI1pDfZnX1vjges  
xBmmSy5lq5vvs+axKK/hTOR7YLSuLJLNwxJgDCPEmHi1hV5Tpj5mLH8qEXu4c+kK  
s9is53v0NvibhIvDEpnqNvL/kMVDak2gTqYHCE2Ij7qcWWNhnGdweMJZsBvLy/Xi  
BLad2t4qHY9lPaeMugDrxThNWEhjoDIOI5f7NpBPYvJgB7b1cJhXqil5weYrJiGr  
hyTr56lff+Xjs8qjgrrzdJ8HHeUsxDJulrX8auo+pIKudcu41U8Ben2M9nCiVbEG  
aqbbPK7xip5c/YZEaZWYAs8w+dif68J8Eo7Q0/kkr45Tt5pf

--12b--

#### [B.2.5.](#) S/MIME signed-only signedData over a complex message, Wrapped Message

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 5631 bytes
  ↓ (unwraps to)
  └─ message/rfc822 1613 bytes
    └─ multipart/mixed 1549 bytes
      └─ multipart/alternative 946 bytes
        └─ text/plain 282 bytes
          └─ text/html 380 bytes
            └─ image/png inline 232 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="signed-data"  
Subject: smime-one-part-complex-wrapped  
Message-ID: <smime-one-part-complex-wrapped@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:04:02 -0500

MIIQOgYJKoZIhvcNAQcCoIIQKzCCECCCAQExDTALBgIghkgBZQMEAgEwggZjBgkq

IG1lc3NhZ2UvcMzjODIyOyBmb3J3YXJkZWQ9Im5vIg0KDQpNSU1FLVZlcnNpb246  
IDEuMApDb250ZW50LVR5cGU6IG11bHRpcGFydC9taXhlZDsgYm91bmRhcnc9Ijhm  
ZiIKU3ViamVjdDogc21pbWUtb25lLXBhcnQtY29tcGxleC13cmFwcGVkCk1lc3Nh  
Z2UtSUQ6IDxzbltZS1vbmUtcGFydC1jb21wbGV4LXdyYXBwZWRAbGhwLmV4YW1w  
bGU+CkZyb206IEFsaWNlIDxhbGljZUBzbWltZS5leGFtcGxlPgpUbzogQm9iIDxi  
b2JAc21pbWUuZXhhbXBsZT4KRGF0ZTogU2F0LCAyMCMCBGZWIGMjAyMSAxMjowNDow  
MiAtMDUwMAoKLS04ZmYKTUlnRS1WZXJzaW9uOiAxLjAKQ29udGVudC1UeXBloIBt  
dWx0aXBhcnQvYWx0ZXJuYXRpdWU7IGJvdW5kYXJ5PSIxYWUiCgotLTFhZQpDb250  
ZW50LVR5cGU6IHRleHQvcGxhaW47IGNoYXJzZXQ9InVzLWFzY2lpIgpNSU1FLVZl  
cnNpb246IDEuMApDb250ZW50LVRyYW5zMVYLUVUy29kaW5nOiA3Yml0CgpUaGlz  
IGlzIHRoZSBzbWltZS1vbmUtcGFydC1jb21wbGV4LXdyYXBwZWQgbWVzc2FnZS4K  
ClRoaxMgaXMgYSBzaWduZWQtb25seSBTL01JTUUgbWVzc2FnZSB2aWEgUetDUyM3  
IHNpZ25lZERhdGEuICBUaGUKcGF5bG9hZCBpcyBhIG11bHRpcGFydC9hbHRlcm5h  
dG12ZSBtZXNzYWdlIHdpdGggYW4gaW5saW5lIGltYWdlL3BuZwphdHRhY2htZW50  
LiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2UgaGVhZGVyIHByb3RlY3Rpb24g  
c2NoZW1lLgoKLS0gCkFsaWNlCmFsaWNlQHNTaW1lLmV4YW1wbGUkLS0xYWUKQ29u  
dGVudC1UeXBloIB0ZXh0L2h0bWw7IGNoYXJzZXQ9InVzLWFzY2lpIgpNSU1FLVZl  
cnNpb246IDEuMApDb250ZW50LVRyYW5zMVYLUVUy29kaW5nOiA3Yml0Cgo8aHRt  
bD48aGVhZD48dG10bGU+PC90aXRST48L2hlyWQ+PGJvZHK+CjxwPlRoaxMgaXMg  
dGhlIDxiPnNtaW1lLW9uZS1wYXJ0LWNvbXBsZXgtZ3JhcHBldWwYj4gbWVzc2Fn  
ZS48L3A+CjxwPlRoaxMgaXMgYSBzaWduZWQtb25seSBTL01JTUUgbWVzc2FnZSB2  
aWEgUetDUyM3IHNpZ25lZERhdGEuICBUaGUKcGF5bG9hZCBpcyBhIG11bHRpcGFy  
dC9hbHRlcm5hdG12ZSBtZXNzYWdlIHdpdGggYW4gaW5saW5lIGltYWdlL3BuZwph  
dHRhY2htZW50LiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2UgaGVhZGVyIHBy  
b3RlY3Rpb24gc2NoZW1lLjwvcD4KPHA+PHR0Pi0tIDxici8+QWxpY2U8YnIvPmFs  
aWNlQHNTaW1lLmV4YW1wbGU8L3R0PjwvcD48L2JvZHK+PC90dG1sPgotLTFhZS0t  
CgotLThmZgpDb250ZW50LVR5cGU6IGltYWdlL3BuZwPDb250ZW50LVRyYW5zMVY  
LUVUy29kaW5nOiBiYXNlNjQKQ29udGVudC1EaXNwb3NpdGlvbjogaW5saW5lCgpp  
VkJPUncwS0dnb0FBQUFOU1VoRVVnQUFBQlFBQUFBVUNBWUFBQUFOaVIwTkFBQUFj  
RWxUFVZSNDDJ1VlRPeGJBCK1BZ1M3MzluTzNUcFJ3MjBkcXBzKFSUUVqT3l3aXdZ  
bkN0a0RLbmJjTGs2NnNxbFQrenQ5Y2lka0UrNkt3a1oKc2dyemZjcVZNcEwyam8w  
NDQ3Z1lEcGVBCmsrT25KSGtJaEFmVFBSaWNpaEFmNVlKcnc3dmp2MFpXUldNL3Vs  
aQp2ZFbMVFamMtERDl4cHBkOHdBQUFBQkpSVTVFcmTKZ2dnPT0KCio0tOGZmLS0K  
oIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJKoZIhvcN  
AQENBQAuVTENMAsgA1UEChMESUVURjERMA8GA1UECXMITEFNUFMgV0cxMTAvBgNV  
BAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydG1maWNhdGlvbiBBdXR0b3JpdHkwIBcN  
MTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoTBELFVEYx  
ETAPBgNVBAsTCExBTvBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIw  
DQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwLjj+gBUCfkacKTg8cc  
20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrszyidmbuZm  
OpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0aGdmnx40G  
/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXCN5XL7wWT  
LMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TwzB2zNS20F  
+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVKarUCAwEA  
Aa0BrzCBrdAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQA4wDAYKYIZIAWUDAgEwATAe  
BgNVHREEFzAVGRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMAoGCCsGAQUF  
BwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj80e0r83z

dw8wHwYDVR0jBBgwFoAUkTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZIhvcNAQEN  
BQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtL4FzkgRy0g3  
1/+Cw7H8e30iLrPIFlWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3MRsMtjH2x9SG9  
1PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZRzWmkw1RF  
7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROsVSYkGiWDp1JhqXwfDz8A0enITGX  
noEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQsqm6hvrDT  
qNpHNZ015fOURza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV57XV/Qqmi  
XDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYxETAPBgNV  
BAStCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmlj  
YXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4  
WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLLEwhMQU1QUyBXRzEXMBUGA1UEAxMO  
QWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQC0  
9InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHUa4xQUl5J  
06VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFSpUByQ+950MFz/evPgP96  
wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2Gxzys02kaYWTut3SryCqeHE  
FbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWffioucfCn+IQsaqpo1d3  
f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcsl7dUy9u9C0gEykrivokF  
QgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAE  
EDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETyWxpY2VAc21pbWUuZXhhbXBs  
ZTATBgNVHSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBsAwHQYDVR0OBBYE  
FLv2zLiThQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwnHFWyn8QkoZTYa  
ZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjD/4Kkk0HG25nY/0e  
NARD6/of0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZlRAZef7GH  
qgB/Nyj0ad3pdpVYeDh4ciNkjbs+aEoTWgAkoqEnt1sRxlcvb7HVX524bKZa1oPT  
UNlm6QpivtqDIdqGJdGf8L1zLfxBuo2zL3HR+M9CDr40pq2JCKzP0Qhp7poIccGE  
6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz0KypyQ3e  
oZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEmMYICADCC  
AfwCAQEwBDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLLEwhMQU1QUyBXRzExMC8G  
A1UEAxMoU2FtcGxliExBTvBTIFJTQSBdZXJ0aWZpY2F0aW9uIEF1dGhvcml0eQIT  
N0EFee11f0Kpolw69Phqzppp1zALBglghkgBZQMEAgGgATAYBgkqhkiG9w0BCQMx  
CwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzA0MDJJaMC8GCSqG  
SIb3DQEJBDEiBCDMOILEox46FkwxHI/3mD5yDe0N8CAfZ/xaQnIOalyyOTANBgkq  
hkiG9w0BAQEFAASCAQBWzuGAP7C0InZ86JeaKimYKXpArooRzZnso+wJtXhZlmTX  
csHp783QCEKYE0F+rv1IrD+fcFULz8Lo7Mm+PWQbtKbx5uZR7IFLGLK+8i8wVCZj  
1Bs2lgpZ/qg1qP+ddCPwZuywITEGnjqqg760HJ0gxJniG3/teIy6dHMI20BogZjN  
kdVSbBh0a9GnTtnWJd2zH7t0tV16NyH3+pNn4DTUWR2IvRgxHky/KT7cIOTfQj9C  
HEizTljQMDvHhoHslWdwjAGjH3foH4CXP1/1bN+qBH2QAuRZ8+LueDcllQsPJXtc  
fUseHVMstoHac0rajLjDZ8FXSLCkmt06RRSQVsT0

#### B.2.6. S/MIME signed-only multipart/signed over a complex message, Wrapped Message

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme.

It has the following structure:

```
├─ multipart/signed 5542 bytes
│   └─ message/rfc822 1671 bytes
│       └─ multipart/mixed 1607 bytes
│           └─ multipart/alternative 1002 bytes
│               └─ text/plain 310 bytes
│                   └─ text/html 408 bytes
│                       └─ image/png inline 232 bytes
└─ application/pkcs7-signature [smime.p7s] 3429 bytes
```

Its contents are:

```
MIME-Version: 1.0
Content-Type: multipart/signed;
  protocol="application/pkcs7-signature"; boundary="ce9";
  micalg="sha-256"
Subject: smime-multipart-complex-wrapped
Message-ID: <smime-multipart-complex-wrapped@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:05:02 -0500
```

--ce9

```
MIME-Version: 1.0
Content-Type: message/rfc822; forwarded="no"
```

```
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="c33"
Subject: smime-multipart-complex-wrapped
Message-ID: <smime-multipart-complex-wrapped@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:05:02 -0500
```

--c33

```
MIME-Version: 1.0
Content-Type: multipart/alternative; boundary="bb6"
```

--bb6

```
Content-Type: text/plain; charset="us-ascii"
```

MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit

This is the smime-multipart-complex-wrapped message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme.

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```
--
Alice
alice@smime.example
--bb6
Content-Type: text/html; charset="us-ascii"
MIME-Version: 1.0
Content-Transfer-Encoding: 7bit

<html><head><title></title></head><body>
<p>This is the <b>smime-multipart-complex-wrapped</b> message.</p>
<p>This is a signed-only S/MIME message via PKCS#7 detached signature
(multipart/signed). The payload is a multipart/alternative message
with an inline image/png attachment. It uses the Wrapped Message
header protection scheme.</p>
<p><tt>-- <br/>Alice<br/>alice@smime.example</tt></p></body></html>
--bb6--

--c33
Content-Type: image/png
Content-Transfer-Encoding: base64
Content-Disposition: inline

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcE1EQVR42uVT0xbA
MAGS739n03TpRw20dqpbfARQEj0ywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ
sgrzfcqVMpL2jo0447gYDpeArk+0nJHkIhAfTPRicihAf5YJrw7vjv0ZWRWM/uli
vdPf1QZ2kDD9xppd8wAAAABJRu5ErkJggg==

--c33--

--ce9
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-signature; name="smime.p7s"
```

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCc0CAQExDTALBgIghkgBZQMEAgEwCwYJKoZI  
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJ  
KoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjERMA8GA1UECzMITEFNUFMgV0cx  
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGhmaWNhdGlvbiBBdXRob3Jp  
dHkwIBcNMTkxMTIwMDY1NDE4WHgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAOT  
BELFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGJjZSBMb3ZlbGFj  
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk  
acKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz  
yidmbuZmOpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0a  
Gdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXC  
N5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz  
B2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK  
arUCAwEAaA0BrzCBrdAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD  
AgEwATAeBgNVHREEFzAVgRNhbGJjZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG  
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDADBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj

80e0r83zdw8wHwYDVR0jBBgwFoAUkTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZI  
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMPTryujRGzJdYA+R9eBAuDLsatbtKtl4F  
zkgRyOg31/+Cw7H8e30iLrPIfLWN1qjHrjgOyIs5AQ/hgxLvLir3hEUv2Z3MRsMt  
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR  
zWmkw1RF7F0D7PFB5v94M5274XYxW2W4uKgd7QGnUZROsvSYkGiWDp1JhqXwfdZ8  
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyu0fQs  
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV5  
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBAQUAMFUDTALBgNVBAOTBELFVEYx  
ETAPBgNVBAsTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIE  
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3  
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGRmREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG  
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK  
AoIBAQC09InoWDgWpk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU  
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz  
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2GxzYms02kaYWTut3  
SryCqeHEFbZfKB4urMk4xrIJC3CzWrus2Q0FHbBlfkgKN5wXVgkWFfi0ucfCn+IQ  
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcsl7dUy9u9C0gE  
ykRiVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIwADAX  
BgNVHSAEEDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETYWxpY2VAc21pbWUu  
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBsAwHQYD  
VR00BBYEFLv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEWjnwHFWyn  
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBAQUAA4IBAQBziaI2p86poGkjD/4KkkOH  
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl  
RAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524  
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfxBuo2zL3HR+M9CDr40pq2JCkzP0Qhp

7poIccGE6I9Tsg+Rr0A9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz  
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm  
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQKQEWJRVRGMREwDwYDVQQLLEwhMQU1QUyBX  
RzExMC8GA1UEAxMoU2FtcGxLIExBTvBTIFJTSBDZXJ0aWZpY2F0aW9uIEF1dGhv  
cm10eQITN0EFee11f0Kpolw69Phqzpp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG  
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqSISIb3DQEJBTEPFw0yMTAyMjAxNzA1MDJa  
MC8GCSqSISIb3DQEJBDEiBCAv+o7fTfRF0qnpRsh2sYz0leh5w2W+5q6Nde9GJQWH  
nTANBgkqhkiG9w0BAQEFAASCAQBrqtTw1eU834PA6rF6Vsac5dGAswyv4vh/EVx0  
xBY7A+uEacaMOXRaSzKtqeh0k0Ga31d2bV6XmWbcR9kNvradw//dX0kctHW/cW6x  
1BALj1aFABYmObCY/FTItu7nLGIAIQcm0W4OVHgH7I/QX0sz3o7hH68SWItJnLDy  
cSEDzRKNh1vl5cN0euY0mNA6HcvKchkILWCj1pcJVMtq3FQE4GNee01x2Pz3ao7y  
vD0/E/s1iF2SiPS7GcgIuywZ1ln5xAwR95/G/LULqWFBXPAPgIMda1kDsqrI++tE  
7aFVuQ9rEoAQJ8KeS8QWA/Lf/iefFfu0ESJxjRDdbJ3+gm5P

--ce9--

#### [B.2.7.](#) S/MIME signed-only signedData over a complex message, Injected Headers

This is a signed-only S/MIME message via PKCS#7 signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 5651 bytes
  ↓ (unwraps to)
  └─ multipart/mixed 1579 bytes
    └─ multipart/alternative 950 bytes
      └─ text/plain 292 bytes
      └─ text/html 387 bytes
      └─ image/png inline 236 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="signed-data"
Subject: smime-one-part-complex-injected
Message-ID: <smime-one-part-complex-injected@lhp.example>
From: Alice <alice@smime.example>
```



To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:06:02 -0500

MIIQRwYJKoZIhvcNAQcCoIIQODCCEDQCAQExDTALBgIghkgBZQMEAgEwggZwBgkqhkiG9w0BBWggggZhBIIGXU1JTUUtVmVyc2lvbjogMS4wDQpTdWJqZWNo0iBzbWltZS1vbmUtcGFydC1jb21wbGV4LWluamVjdGVkdQpNZXNzYWdlLlU0E0iA8c21pbWUt b25lLXBhcnQtY29tcGxleC1pbmpleY3RlZEBsaHAuZXhhbXBsZT4NCkZyb206IEFs aWNlIDxhbGljZUBzbWltZS5leGFtcGxlPg0KVG86IEJvYiA8Ym9iQHNTaW1lLmV4 YW1wbGU+DQpEYXRl0iBTYXQsIDIwIEZlYiAyMDIxIDEyOjA20jAyIC0wNTAwDQpD b250ZW50LVR5cGU6IG11bHRpcGFydC9taXhlZDsgYm91bmRhcnc9IjVkJYSI7IHBy b3RlY3RlZC1oZWFKZXJzPSJ2MSINCg0KLS01ZGENCK1JTUUtVmVyc2lvbjogMS4w DQpDb250ZW50LVR5cGU6IG11bHRpcGFydC9hbHRlcml5hdG12ZTsgYm91bmRhcnc9 IjllYyINCg0KLS05ZWMNCkNvbRlbnQtVHlwZTogdGV4dC9wbGFpbjsyY2hhcnNl dD0idXMtYXNjaWkiDQpNSU1FLVZlcnNpb24IDEuMA0KQ29udGVudC1UcmFuc2Zl ci1FbmNvZGluZzZogN2JpdA0KDQpUaGlzIGlzIHROZSBzbWltZS1vbmUtcGFydC1j b21wbGV4LWluamVjdGVkIG1lc3NhZ2UuDQoNClRoXMGaXMGYSBzaWduZWQtb25s eSBTL01JTUUGbWVzc2FnZSB2aWEgUETDUyM3IHNpZ25lZERhdGEuICBUaGUNCnBh eWxvYWQgaXMGYSBtdWx0aXBhcnQvYXNzZXJuYXRpdmgWVzc2FnZSB3aXRoIGFu IGlubGluZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMGdGhlIEluamVj dGVkIEhlyWRlcnMgaGVhZGVyIHByb3RlY3Rpb24gc2NoZW1lLg0KDQotLSANCkFs aWNlDQphbGljZUBzbWltZS5leGFtcGxlDQotLTllYw0KQ29udGVudC1UeXB0iB0 ZXh0L2h0bWw7IGNoYXJzZXQ9InVzLWFzY2lpIg0KTUlnRS1WZXJzaW9u0iAxLjAN CkNvbRlbnQtVHJhbnNmZXItRW5jb2Rpbmc6IDdiaXQNCg0KPGh0bWw+PGhlyWQ+ PHRp dGxlpjwvdG0bGU+PC9oZWFKPjxi b2R5Pg0KPHA+VGhpcyBpcyB0aGUgPGI+ c21pbWUtb25lLXBhcnQtY29tcGxleC1pbmpleY3RlZDwvYj4gbWVzc2FnZS48L3A+ DQo8cD5UaGlzIGlzIGlzeGc2lnbmVklW9ubHkgUy9NSU1FIG1lc3NhZ2UgdmhIFBL Q1MjNyBzaWduZWREYXRhLiAgVGhlDQpwYXlsb2FkIGlzIGlzeGc2bWVzc2FnZS48L3A+ dGVybWFnZS48L3A+Z2Ugd2l0aCBhbiBpbmpleY3RlZCBIZWFKZXJzIGhlyWRlciBwcm90 Y2htZW50LiBjZCB1c2VzIHROZSBjbmplyY3RlZCBIZWFKZXJzIGhlyWRlciBwcm90 ZWN0aW9uIHNjaGVtZS48L3A+DQo8cD48dHQ+LS0gPGJyLz5BbGljZTxici8+YWxp

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Y2VAc21pbWUuZXhhbXBsZTwvdHQ+PC9wPjwvYm9keT48L2h0bWw+DQotLTllYy0t DQoNCi0tNWRhDQpDb250ZW50LVR5cGU6IGltYWdlLl3BuZw0KQ29udGVudC1UcmFu c2Zlci1FbmNvZGluZzZogYmFzZTY0DQpDb250ZW50LURpc3Bvc2l0aW9u0iBpbm xp bmUNCg0KaVZCT1J3MEtHZ29BQUFBTlNvaEVVZ0FBQUJRQUFBQVVDQVlBQUFDtMlS ME5BQUFBY0VsRVFWUjQydVZUT3hiQQ0KTUFnUzcz0W5PM1RwUncyMGRxcGJmQVJR RWpPeXdpd1luQ3RrREtuYmNMazY2c3FsVCT6dDljaWRrRSs2S3drWg0Kc2dyemZj cVZNcEwyam8wNDQ3Z1lEcGVBCmsrT25KSGtJaEFmVFBSaWNpaEFmNVlKcnc3dmp2 MFpXUldNL3VsaQ0KdmRQZjFRWjJrREQ5eHBwZDh3QUFBQUJkU1U1RXJrSmdnZz09 DQoNCi0tNWRhLS0NCqCCB6YwggPPMIICt6ADAgECAhMPLSW9ETmXS5CVIeh7j00 Boq0MA0GCSqGSIB3DQEBDQUAMFUDTALBgNVBAoTBE1FVEYxETAPBgNVBAsTCExB TVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIENlcnRpZmljYXRpb24g

QXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4WjA7MQ0w  
CwYDVQKKEwRJRVRGMREwDwYDVQQLLEwhMQU1QUyBXRzEXMBUGA1UEAxMQWxpY2Ug  
TG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQCalsn6i8Gi  
44/oAVAn5GnCh4PHHNjrSfWUnneLn41KImVaTC3D9zFCrS3i4Pa9ZgHyA5Qf8JW3  
ZmnVz5q7M8onZm7mZjqQeb6FUH4i2GMt4jse2Dqs165ernT905NLFFlHUjURca3y  
nqEBBV4DmhnZp8eDhv3t6dXyCjNHT82S6DgCRZuTtMc1zy++MxQlqdn9WZLh0AO  
peNZKGmVwjeVy+8FkyzC3jX/Qcm+ZLCqLLqhBwDhdZ5qDTII2PVX1X3K7/cONxhv  
BbaUl/k1swdszUtjhflyFZ80RuQ3qFC6vL/PGeWy6SCf58duq/AOEksCAWlb+MD8  
QH9Yj7CFSmq1AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAEEDAOMAAG  
CmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETYWxpY2VAc21pbWUuZXhhbXBsZTATBgNV  
HSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBSAwHQYDVR00BBYEfKJTQdVE  
PIApFXwBI/Dnjq/N83cPMB8GA1UdIwQYMBaAFJEWjnwHFWyn8QkoZTYaZxxodvRZ  
MA0GCSqGSIb3DQEEDQUAA4IBAQCBSXignLEynBakDKU68ro0RsyXWAPkfXgQLgy7  
GrW7SrZeBc5IEcjoN9f/gS0x/Ht9Ii6zyBZVjdaox644DsiLQEP4YMS7y4q94RF  
FdmdzEbDLyX9sfUhvdTxDN00oHz53PYDBh4zE4Nar2inC0D+VM6RGDy66K9l+D+b  
l8Wj9CyGUc1ppMNURexTg+z3web/eD0du+F2MVtluLihne0Bp1GUTkr0mJBolG6d  
SYal8Hw8/ANHpyExl56BJABb744gqoeuD9YSHjKK49+qYC9faFmQ+mK80lh1M9Rd  
NI7srjn0LKpuob6w06jaRzWdNeXzLEc2tUpAr4vRhZjVD6FYMIIDzzCCAregAwIB  
AgITN0EFee11f0Kpolw69Phqzppq1zANBgkqhkiG9w0BAQ0FADBVMQ0wCwYDVQKKEwRJRVRGMREwDwYDVQQLLEwhMQU1QUyBXRzEXMCA8GA1UEAxMQU2FtcGxliExBTBVT  
IFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eTAqFw0xOTExMjAwNjU0MThaGA8y  
MDUyMDkyNzA2NTQxOFowOzENMA8GA1UEChMESUVURjERMA8GA1UECXMITEFNUFMg  
V0cxFzAVBgNVBAMTDkFsaWNlIEExvdmVsYWNlMIIBIjANBgkqhkiG9w0BAQEFAAOCC  
AQ8AMIIBCCKCAQEATPSJ6Fg4Fj5Nmn9PkrYo0jTkfCv4TfA/pd0/KLpZbJOAER0s  
I7Aja07B1GuMUFJESTuLamNfCwDcDkY63PQWl+DILs7GxVwXurhYdZlaV5hcUqVA  
ckPvedDBc/3rz4D/esFfs+E7QMfTmd+K04s+A8TCN012DRVBDpbP4JFD9hsc8prD  
tpGmFk7rd0q8gqnhxBW2RZAelqzJOMayCQtwslq7ktkNBR2wZX5ICjecF1YJFhX4  
jrnHwp/iELGqqaNXd3/Y0pG7QFecN7836IPPdfTMSiPR+peCrhJZWLSewbWXLJe3  
VMvbvQj0BMPeylaJBUIKk01zQ1Pq90njlsJLOWIDAQAB04GvMIGsMAwGA1UdEwEB  
/wQCMAAwFwYDVR0gBBAAwDjAMBgpghkgBZQMCAATABMB4GA1UdEQQXMBWBE2FsaWNl  
QHNTaW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYIKWYBBQUHAWQwDgYDVR0PAQH/BAQD  
AgbAMB0GA1UdDgQWBBS79syyLR0GEhyXrilqkBDTIGZmczAfBgNVHSMEGDAWgBSR  
MI58BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG9w0BAQ0FAAOCAQEAc4miNqf0qaBp  
I3f+CpJDhxtuZ2P9HjQE+qV6BdP7GKJ19naIs3BjJ0d64roAKHAp+c284VvyVXWJ  
99FMX8q2ZUQMxH+xh6oAfzcozmnd6XaVWHg4eHIjSo27PmhKE1oAJKKhDbdbEcZX  
L2+x1V+duGymWtaD01DZZukYr7agyHahixRn/C9cy31wbqNsy9x0fjPQg6+Dqat  
iQpMz9EIae6aCHHBh0iPU7IPkazgPYgkLD59fk4PGHnYxs1Fhd06zZk9E8zwlc1A

LgZa/iSbczsqckN3qGehD2s16jMhwFXLJtBiN+uCDgNG/D0qyTbY4fgKieUHx/t  
HuzUuszXjJGCAgAwggH8AgEBMGwwVTENMA8GA1UEChMESUVURjERMA8GA1UECXMITEFNUFMg  
V0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlnaWNhdGlv  
biBBdXRob3JpdHkCEzdBBXntdX9CqaJc0vT4as6aqdcwCwYJYIZIAWUDBAIBoGkw

GAYJKoZIhvcNAQkDMQsGCSqGSIb3DQEhATAcBggqhkiG9w0BCQUxDxcNMjEwMjIwMTcwNjAyWjAvBgkqhkiG9w0BCQQxIgQgSnZFRpoKyudHBvkAo6hqyxtaGzBVpz8Rsk+FJtjH7PgWdQYJKoZIhvcNAQEBBQAEggEADAiUCPKW4o6qXePSs+Yh+ZPDq8Zyv5hHLSNGGLmQP82ZDL/+zob54QvODTFnFb8SNL05nxIZlmZo/XtxRThlSiIy/CnbxL9dkylf0a0dtkc5MMv+W5AWQQ4CsJfkN+g9EPr+XcsFCn7Dsb/Vu836eZhSQ+tBkttfKuhy/XKImI3fp5GLZhGu5NVWnwwC+lUm3AoKhmKhI3M8Kct84xpMGYXHJd1tDfADNo6cWgQ0pQeF7mSh4gSneysep2koZNVx9LpCjoYzto6t5DorJBtBiZBr7qBgjY68KcMpZ2N4IIPLtcup96bHPeR+IkDqaF4EeeFIfCysEKBRFkbF+qzgNw==

#### B.2.8. S/MIME signed-only multipart/signed over a complex message, Injected Headers

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme.

It has the following structure:

```
├─ multipart/signed 5510 bytes
│   └─ multipart/mixed 1637 bytes
│       └─ multipart/alternative 1006 bytes
│           ├── text/plain 312 bytes
│           ├── text/html 410 bytes
│           └─ image/png inline 232 bytes
└─ application/pkcs7-signature [smime.p7s] 3429 bytes
```

Its contents are:

```
MIME-Version: 1.0
Content-Type: multipart/signed;
  protocol="application/pkcs7-signature"; boundary="34f";
  micalg="sha-256"
Subject: smime-multipart-complex-injected
Message-ID: <smime-multipart-complex-injected@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:07:02 -0500
```

```
--34f
MIME-Version: 1.0
Subject: smime-multipart-complex-injected
Message-ID: <smime-multipart-complex-injected@lhp.example>
From: Alice <alice@smime.example>
```

To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:07:02 -0500  
Content-Type: multipart/mixed; boundary="193"; protected-headers="v1"

--193

MIME-Version: 1.0  
Content-Type: multipart/alternative; boundary="db5"

--db5

Content-Type: text/plain; charset="us-ascii"  
MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit

This is the smime-multipart-complex-injected message.

This is a signed-only S/MIME message via PKCS#7 detached signature (multipart/signed). The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme.

--

Alice  
alice@smime.example  
--db5  
Content-Type: text/html; charset="us-ascii"  
MIME-Version: 1.0  
Content-Transfer-Encoding: 7bit

```
<html><head><title></title></head><body>
<p>This is the <b>smime-multipart-complex-injected</b> message.</p>
<p>This is a signed-only S/MIME message via PKCS#7 detached signature
(multipart/signed). The payload is a multipart/alternative message
with an inline image/png attachment. It uses the Injected Headers
header protection scheme.</p>
<p><tt>-- <br/>Alice<br/>alice@smime.example</tt></p></body></html>
--db5--
```

--193

Content-Type: image/png  
Content-Transfer-Encoding: base64  
Content-Disposition: inline

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcELEQVR42uVT0xbA  
MAGS739n03TpRw20dqpbfARQEj0ywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ  
sgrzfcqVMpL2jo0447gYDpeArk+OnJHkIhAfTPRicihAf5YJrw7vjv0ZWRWM/uli  
vdPf1QZ2kDD9xppd8wAAAABJRU5ErkJggg==

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Content-Transfer-Encoding: base64

Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCc0CAQExDTALBgIghkgBZQMEAgEwCwYJKoZI  
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0R0ZdKzkJU6HuPTQGirQwDQYJ  
KoZIhvcNAQENBQAwVTENMA5GA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx  
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGhmaWNhdGlvbiBBdXRob3Jp  
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAOT  
BELFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj  
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBABJqVKfqLwLjj+gBUCfk  
acKTg8cc20tJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz  
yidmbuZmOpB5voVQfiLYYy3i0x7Y0qzXrl6udP07k0sV+UdSNRFxrfKeoQEFXg0a  
Gdmnx40G/e3p1fIKM0dPzZLo0AJF5m500xzXPL74zFCWp2f1ZkuE4A6l41koaZXC  
N5XL7wWTLMLenF9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz  
B2zNS20F+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK  
arUCAwEAAa0BrzCBrdAMBGNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYZIAWUD  
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG  
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAWIFIDAdBgNVHQ4EFgQUo1NB1UQ8gCkVfAEj  
80eOr83zdw8wHwYDVR0jBBgwFoAUKTC0fAcXDKfxCSHlNhpnHGh29FkwDQYJKoZI  
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMPTryujRGzJdYA+R9eBAuDLsatbtKt14F  
zkgRy0g31/+Cw7H8e30iLrPIfLWN1qjHrjg0yIs5AQ/hgxLvLir3hEUV2Z3MRsMt  
jH2x9SG91PEM046gfPnc9gMGHjMTglqvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR  
zWmkw1RF7F0D7Pfb5v94M5274XYxW2W4uKGd7QGnUZROsvSYkGiWdp1JhqXwFdZ8  
A0enITGXnoEkaFvviCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyufQs  
qm6hvrDTqNpHNZ015f0URza1SkCvi9GFmNUPoVgwgGPPMIICt6ADAgECAhM3QQV5  
7XV/QqmiXDr0+Gr0mqnXMA0GCSqGSIb3DQEBAQUAMFUDTALBgNVBAOTBELFVEYx  
ETAPBgNVBAsTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFNUFMgU1NBIEENl  
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3  
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG  
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK  
AoIBAQC09InoWDgWpk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU  
a4xQUl5J06VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxFSpUBByQ+950MFz  
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUE0ls/gkUP2GxzYms02kaYWTut3  
SryCqeHEfBzFkB4urMk4xrIJC3CzWruS2Q0FHBBlfkgKN5wXVgkWFfi0ucfCn+IQ  
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElNAtJ7BtZcs17dUy9u9C0gE  
yKriVokFQgqQ7XNDU+r3Se0Wwks7AgMBAAGjga8wgawwDAYDVR0TAAQH/BAIwADAX  
BgNVHSAEEDA0MAwGCmCGSAFlAwIBMAEwHgYDVR0RBBCwFYETWxpY2VAc21pbWUu  
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDA0BgNVHQ8BAf8EBAMCBsAwHQYD  
VR00BBYEFLv2zLIthQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJJEwjnwHFwyn

8QkoZTYaZxxodvRZMA0GCSqGSIB3DQEBDQUAA4IBAQBziaI2p86poGkjd/4Kkk0H  
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl  
RAzEf7GHqgB/Nyj0ad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENT1sRxlcvb7HVX524  
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr40pq2JCkzP0Qhp  
7poIccGE6I9Tsg+Rr0A9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz  
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm  
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQKQEWJRJRVRGMREwDwYDVQQLLEwhMQU1QUyBX  
RzExMC8GA1UEAxMoU2FtcGxleXBTBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv

cm10eQITN0EFee11f0Kpolw69Phqzpp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG  
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIB3DQEJBTEPFw0yMTAyMjAxNzA3MDJa  
MC8GCSqGSIB3DQEJBDEiBCBpheScfJ+ESh8/z2r5jHx3Lw+5Vkh8zTic03HRGxfm  
ozANBgkqhkiG9w0BAQEFAASCAQADy9VgxUcoI8DWKdyHqPM8nLuaHB1B/SONgbzi  
4S1gIMs4wR6S02LpiG36z4/zFw0JUbvqWC2WJN7+W0Vra6ZX/x7Hfmv+uqdsMW6j  
r8IXATRFWNm6GEBih2BsYABTNy8z0JGs+y6dcNNdDIwDJIKJETi+xv1eFA0deoWI  
PyHmUjppzzj0cTAKFnSsa4lwSB0ty8lZPW6u0klUx+VVGKkgg/0uXTBB1yGD02gbw  
q5893Rx03g5zzxaYJP03zy0/WW7FmCJNNQbyZbQD8R4rvR0hVna0r7XoW4Q+WZfU  
Dz29oLszzmumpedAaP7q/M0jySdSjWfQn1W5hHHhAMilwcqt

--34f--

### [B.3.](#) Encrypted-and-signed Messages

These messages are encrypted and signed. They use PKCS#7 signedData inside envelopedData, with different header protection schemes and different Header Confidentiality Policies.

#### [B.3.1.](#) S/MIME encrypted and signed over a simple message, Wrapped Message with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Wrapped Message header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 7345 bytes
  └─ (decrypts to)
    └─ application/pkcs7-mime [smime.p7m] 4436 bytes
      └─ (unwraps to)
        └─ message/rfc822 679 bytes
```

└ text/plain 321 bytes

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <smime-enc-signed-wrapped-minimal@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:08:02 -0500

MIIIVLAYJKoZIHvcNAQcDoIIIVHTCCFRkCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV  
BAoTBElFVEYxETAPBgNVBASTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFN

UFMgUlnBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00  
Boq0MA0GCSqGSIB3DQEBAQUABIIBAFHb+aM8bhyJ1nFFuBDyyBVQf2IplykrvvYb  
mKqBk08i2gecPSOMTKW5e2oQ4+WT4rtU4E0JXfMSA2KukKc+QUA3ycVCoL5zhEtX  
GsEx74S5P4JMY/uAoyBLEogGNI2lvagvg0GkqHJCZAjKjPNmqyTfafyv1Y4BQRQ+  
WJi7mURDIbgrc0xfcc/yt7UWxFlfUhm6n7rTvRKhe4D0E00B8yKupUgcDzBMTw5F  
P9HEy0vFij12+LNKSS0PhVp0PbPkmCVi+ERTXEgV7C7BRVVYBiprpYJxJry09t3E  
jmIupqHZMgXxlAKFpBsdLPWfI1mrMVZTBpRgy8Bds7CORgWbs0MwggGEAgEAMGww  
VTENMASGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh  
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvb1BdXRob3JpdHkCEzB8R0APhiY6  
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAX1PxPDDLv2Wo766+MhR82lW8  
pD0GWAM1ScYPggh4t50FmSjFtyiqawhMcQhoRsAkGV387oXupYXH/lkaD7nIdZW+  
pZK1/RZUU0txvlsRIpJduXcWm/Dsu0lQtQSfcg5FaslSMjBpMI41BD2KC9M5meDP  
NqHnzNMFv0ZiP06x+bTCXhds8WTi/B2DDyXGjEaN6RUFw6rKNXwbXoR0DJCMosF5  
55gQuo1k040YMqYRwdsJGETr/r/JaEPwNekogAfuXBkNE3JQB7aVgePp8mIZNIIU  
0nP6eXp95UwLsoA/zwb0v9XSYgQDCcQ0MWycXmmn4ysbeWi1p7P+6CLwgx/TNTCC  
Ef4GCSqGSIB3DQEHATAdBglghkgBZQMEAAIEEN9EoELwqIPQUHcQvENM3K+AghHQ  
7MaGZ6VZ5f9fpYjTHCbQSjcBtsF3qd7/z94CkYE+Fdt4Xtm91GLDSRONaVuT9yV6  
vd3hoFTCfrX1aQSzzHn3SPtIh7ySaTG70ctsXP33UjcMjzDbvyvfIl1mxsct5rSx  
e+cJ4z++pLB0vQeq1JlbuqY8SkSX9FyDZegnUD+zCB3qv7YSZEwD+EjifauMcrL5  
p29hRgVx522WoILf6Ty14stVYot76cy0YE5AlEUMxBg98tLLzNgvgpevmhZwNzby  
B3v68cMTXh8Zm8UB6F17oxdLFIshEMnM4v2RSWB507L5C4ab+zWpB58Ac0eIesg  
E9TvdhcJVsiQHLMtVqxXcyyzlh/T1g1YZnfI4+Q0gNTTS9kp5y2JpL8AWiHV3LJH  
ltigpNDSLfbSkC4ZUKNLmwMTed03kH2leAZGK9afAC+nNwKvSlhWovXXujmTwGao  
8fQPc9cKfRS3tx5d0nEY5A6ZPbAx3SkcdHpUc/Z6Z9at0NnN80ppl55sichJeP+Q  
yoWX/IMhZwNksoiP1Wqa2KYGk89l3EvB00KMH3G/I0cilg75VxjfkQ/IrB6xrhb7  
wY3YCV14MtJ4T9gi0rtkXxq6YfJ6LQVXP3BWpmlf3xwxQn3HUsQNFO/dESQMik0y

PgNT/wkwX0+v0XY59maI2tF9sMFiheLeRRjPDbwaXNCX4ghzpoA0KQ1+0/upcXPd  
02sskI3b3qh+gbRhTU0xAMA5i/POQ6Q0j/0jxfbn081YdiHE49jlx5MA00u/yn2V  
WKLdKXE570tX5Z3upvQvLVYuc7+hfsr0oIC/A+4UKzt3G3kjmHqKvkPeP4ytu5Cw  
VxRQlhl+rWISO/EzflNHsgNwE/X3e0mub8vNl/fX9ng5hMVaz38pAQyQysr2Rg2s  
ZDasrLS4kWuG0tv8gXD+Lm34r31bQfl+0NoVpJFV0iHYzBcmL+refdBec9Jfm0yI  
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### B.3.2. S/MIME encrypted and signed over a simple message, Injected Headers with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 7305 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 4406 bytes
    ↓ (unwraps to)
    └ text/plain 333 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <smime-enc-signed-injected-minimal@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:09:02 -0500

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Internet-Draft

Header Protection S/MIME

March 2022

```

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```

### [B.3.3.](#) S/MIME encrypted and signed over a simple message, Injected Headers with hcp\_minimal (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

```

└─ application/pkcs7-mime [smime.p7m] 7565 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 4584 bytes
    ↓ (unwraps to)
    └─ text/plain 423 bytes

```

Its contents are:

```

Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID:
  <smime-enc-signed-injected-minimal-legacy@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:10:02 -0500

```

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**B.3.4.** S/MIME encrypted and signed over a simple message, Wrapped  
Message with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7  
envelopedData around signedData. The payload is a text/plain



message. It uses the Wrapped Message header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 7345 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 4432 bytes
    ↓ (unwraps to)
    └ message/rfc822 675 bytes
      └ text/plain 319 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <73a42f8e-8f5a-5c62-b982-82ace766fd32@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:11:02 -0500
```

```
MIIVLAYJKoZIhvcNAQcDoIIVHTCCFRkCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV
BAoTBELFVEYxETAPBgNVBAsTCExBTBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlnBIENlcnRpZmZlYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAUMG7sjRDCJDMqgvQrFh4sk9MkaJJY7q6B3r
```

```
hY87n3jM6UYk/ZaBi9uzcB1pDAF0hJkFLmo+PRUbFLUrmeYfQI60uvVElpwIDWMP
cMtfzLXgKA06fh/On6aoVhpfv9EmaG1rCU5ezDPPbaXW8caNi2/yvL0ustpqKOTj
cOLgMK45tPcHeIaSD+8A4P0uf/GLzEFhDPdJrt3mVq76UbAoIGasA/sDhhg0xygq
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VTENMAsgA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlnaWNhdGlvb1BbdXR0b3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEALvjSc3y8/+aA+Mk2+8tup051
fsr8cR8BV0+aR/CYDXaeAFg6CPk12PnLcpFRZDdqitxfe7SpMgk0oT3IsBxvu0sr
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JXBkymfUAe5+x8/gGQYNJdvNC+v9cmnwTORFF/IJ/WcGsyHPHxguR+JZqIJkSI8T
xjawV40qcahz5G/03vLI8kxW96lSSmVE9WIuPafsMbP1KZN/6i1gaUOPFcsH1jln
fdnk3fToayCGwOAQvh/UyvlGTA06Rtnmz44YLZiGbVLFLGLvcXFfwL1JLdl25DCC
Ef4GCSqGSIb3DQEHATAdBglghkgBZQMEAAIEEJo6k0dMHnCo9aCxbG8k8qSAghHQ
```

oifxeGRuuDaxdcCkEyNhsAq0P92jEteuI38u48FqaDfBniUs9wmW/EiEaTmXWvdB  
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Dv0XZNUQQSzXFSpnGo7w0LoUh9GB5G0IBDqtAShYsCXbU3fuXl8/6Lojv+f0YBBN  
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9iRvigf0u4hQrowNuR+5t6bjA+5nfpKimd/3G6JdvY+QcN3BizQ39ZyUrUr3pmY5  
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Y1NPHo1SYvqScQ7K3LVVsiqAzbr7SHOABDF8ZtfwVqIDDmk7cubaTLUEdGA/tXTu  
iQMYNv8iJ4MmE0tte0sRrPKKbnEPlf+UiSI2LDEYPuvXooGoroNFHzqPUX+6BswB  
8GSEpsQDPzSJLYTugYrX+2PLM75c89dhfuidAHdubHMqurOUaWtTKTL57rd9en4e  
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UsUJ8lopNmbY+Pf5XGvp92PtXzIBJyJ1Wfp0nCX3g4LhuwHpi5J0Gu2nfKD2LZR9  
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r3I2871gQAni/LsF8CEAPaXE6swdSsfC0GWTi5W+jnDh2oeAWeU0qb10+vwLikC+  
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Efcmds0p3V5B4ZaXLfR6aHdtrDT+B8eNb1bB2wOP/IA7Up4NzVf9BtEzq2JKj18  
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rcnklWkphSq9HL6brXQsS3lODDHsy8xIJlu5RrGD2MOIOy/rbMxNT5WnGoZ6j/RJ  
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#### B.3.5. S/MIME encrypted and signed over a simple message, Injected Headers with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 7305 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 4402 bytes
    ↓ (unwraps to)
    └ text/plain 331 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <27139e00-e05f-581d-a339-d2bd43bd0f42@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:12:02 -0500

MIIVDAYJKoZIhvcNAQcDoIIU/TCCFPkCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV  
BAoTBElFVEYxETAPBgNVBAstCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFN  
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Boq0MA0GCSqGSIB3DQEBAQUABIIBAFemxt6IIoOR5Kq2Jiucu85qezrNEQcYm6sV  
Cuo2f+/3QCmr85ho7PNGXSmj0LkmkvIAH4RYf2fH6jqYSYgsxQjT3j0cx70hhTms  
zQV8e/UJvWRvxQHhPbtdDFketPi2CA++Y8zqvb13L/dBeL+ltiQqcQprqy9RY5pH  
FibcQ50kxPIzBZQUL5NrjwRf16gujq+nGVrhphjwjWsCX+ypt6ZrrBPtje3Iudw6

Internet-Draft

Header Protection S/MIME

March 2022

/0MkMj2lJPEkgWvFEFNL/FkcNRzHlH3dQxqjaf28Jp7eY/3tF4NVHcirE9DSc6hV  
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#### [B.3.6.](#) S/MIME encrypted and signed over a simple message, Injected Headers with hcp\_strong (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

- └ application/pkcs7-mime [smime.p7m] 7540 bytes
  - ┆ (decrypts to)
    - └ application/pkcs7-mime [smime.p7m] 4576 bytes
      - ┆ (unwraps to)
        - └ text/plain 419 bytes

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <fdccb76a-49ed-50c5-9030-e4aeb83d7f04@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:13:02 -0500

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**B.3.7.** S/MIME encrypted and signed reply over a simple message, Wrapped Message with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Wrapped Message header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 7605 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 4626 bytes
    ↓ (unwraps to)
    └─ message/rfc822 816 bytes
      └─ text/plain 327 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <smime-enc-signed-wrapped-minimal-reply@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:14:02 -0500  
In-Reply-To: <smime-enc-signed-wrapped-minimal@lhp.example>  
References: <smime-enc-signed-wrapped-minimal@lhp.example>

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cJY2hGykCCDvfrTBjTuvIB5KeKgMfJRJDMtGAfzPESCX0ZcDr4pXX4im1japeGUx

**B.3.8.** S/MIME encrypted and signed reply over a simple message,  
Injected Headers with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7  
envelopedData around signedData. The payload is a text/plain  
message. It uses the Injected Headers header protection scheme with  
the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 7585 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 4600 bytes
    ↓ (unwraps to)
    └─ text/plain 339 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID:

<smime-enc-signed-injected-minimal-reply@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:15:02 -0500  
In-Reply-To: <smime-enc-signed-injected-minimal@lhp.example>  
References: <smime-enc-signed-injected-minimal@lhp.example>

MIIV3AYJKoZIhvcNAQcDoIIvzTCCFckCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV  
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLWYDVQQDEyhTYW1wbGUgTEFN

UFMgULNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00  
Boq0MA0GCSqGSIB3DQEBAQUABIIBABgRQRzXTRs0Jqxr19ouqlyy0UVTZpzsEN4E  
rRGV0bKl0V1080iF4s730amfc1GowC6Y0ss5JBen3EQq5NmMsFXjlU5sSiFGgsX6  
IjkVSHC9c9QtdJtXyEoqEhf2lGJ22FcLjU0M21XxtKMlArch5aouJ01+nTj8AIqk  
25JNVqG2dpiLaN61T9hSnyZe7bqDUflBo5Xm5RE0c6EBv0+lFgjtIJB73QWiGBu9  
C9iPJPz7du0yIREoX0wtKClqUzrBEiq064SNQ2MuLTlRl2niNDfaQrvfDa62Y6Zz  
RKPE+I461BxC2EvP18cJVdmOLPE/41b6QPu38l6L8/fSoKYocK8wggGEAgEAMGww  
VTENMASGA1UEChMESUVURjERMA8GA1UECXMITEFNUFMgV0cxMTAvBgNVBAMTKFNh  
bXBsZSBMUU1QUyBSU0EgQ2VydGlmaWNhdGlvb1BdXRob3JpdHkCEzB8R0APhiY6  
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAbgfLLBuq/SuTA535o03fl0T7  
hFJz1cRgrOgdYfajI+bAIAncrUXPCxEhAIIJAV9DN0JnISnnTNW0E5ND32Dbcj83  
GwhT2iC+Uzx+0auUYuuVZ/go7eHMUwRY1Vm5dqNq5JbTwVgWy8lIC5CatZVYDVFW  
o26J351tuF7mAaIaLYX0nUrLgqWpgqI7zXjHrL0hADXLajARcCY3Uv/PO1Y0sb83  
1zQQs7Mu82fjhmJWqZ4yQX7rBKSk5V3aoPjFcj1w2vQWUXHqczJmr0ZHYiaZQuLT  
gg1kNNSPNFVlfipXESE0ksP3ZoM+DzLahjfKSLiQTY1Gacasb9+oVwALBhUoCTCC  
Eq4GCSqGSIB3DQEHATAAdBg1ghkgBZQMEAAIEEKODP8WCdJVi340U9/jVCwaAghKA  
Ed5TZquhpH35bEbuVz9wfPotJ0KJ6xieYlQEccchc8+87Log3fBKWsZo1NwCRMZzW  
PhE8p73CscBYylFWDtwWTtQfsu+pizFoH1B2u+byGhyr+cEV0cI2hSM7BTFzBEbR  
RLAWNZse0ZlvW9MABUHhu/7QFVwV9LYaL+ULEEAvoPfnX1QP1WPbjyI14v+/4i4B  
6jk2HBMlN2r7Kjk1+i0hdt8V7WXHRwifG09rGmZzi4hVkfIiRkq0qXpghbsH0dTL  
mWf8LfMXatmz39ueE27ZJC/1KHgYfdFqQkTfSutBP05eP7LJHPn3cb7ktJ3wmEj+  
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Z7LA4qbfbpw3708ps9KmKmlcrhmDs62DkZP26LKUgC98FmpmKgpKmpb/V475+0LZ  
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hgANe0pnA87omyIXs3lWpkApS3Ri4HrLJXj8sM1gqJABeQE00cej3yIlIcKgVh1J  
OYPfeRlibKzDHbIpVFs5QMzKNNwil/t2+VmuV9Reye1pdtpXPFDp68ilPO/VCyMk  
Uq6yKfU/3gtieCtCgYbh/5dAcYwAVwB4XvYqC04Sxj369X90TBM5Ege/4e/jcNik  
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/44HfmulG/cxGTWfJrXq54hh+UteebsyKUx9Um4LGqs29HIx5skDV0xhzYPM3+J9  
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q4hyRecPQeC089AryPZor5CQ2H1fi1ibSDcILtCP2UDzScA9qd3lvMRZV83rFcYl  
cRYGUyckJP6aJFYUPCXRIdei9/nSkLDCIjtVHESDyUtGFTv8DeTH208INYj5xjBv  
cEtW1IM2DXft68jf9Z5XsnUM1Q02jhLDaUptBWmKDgzeQa3KESniqdceGLrTM1H0  
lFgMPFEn9W/Ma3pdi2I21TnzIcS7Za0+NG/2ZLKXMEVBrXVEU+R7heEo6mey9+qV  
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9aoVqxh9xNiDM0+6Gh0xHbc3m712hWT6yIHYcPCHzC/wqBE7VE1jCq5PF3ZpfrBz  
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NpSGqNdGU6q4o7aCtjegr0coM4xyfy0EKyq04w5oXhYzAQ7qGvN4j0iW+WWtIX6x  
kMV1cVXLzeJ/oNXL1aIgZjt+sN8MGTF1IBftWxfuG0+WkvWwu07D/BTsxexdfstQ  
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SX/LC//AosoGt1gzAFtBa7/n3Xup3EqME+nXH1K0xjvED8jh6xchDA8U+tSghuC1  
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FKjWedjnGYAJIHSZCljRDosskfmgCEL4nfgMwVfqF+xS8bTxyQu5RxqwBPDk8EM9  
ZN1EH4WY00hgN4N2oqlLTUn8L2Ehx5JAhiTckZz+cp/nzKVpKArnjbQPcJTBUDiG  
PT28zjiTkrZileKw1C2zwaQ8K0jMjRp1An1P6zSiuaYEtF/GW8nHzG9FcJoRlMKR  
TUt05KBg7wgE1RxPumyws1RL4cpIb2oWlyfSqlYNHdNCQykyuu/ubaQVg3VZyz03  
CRl5V3ErDa95ZM+cbaGx2JMXR29N6wTXEGi8FCMZpS5gTucp67yZtG3Ik+PPWkih  
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gpdgE4EhL0mGG+ylj1wC6Isrqdj41aR5m3ZwMeucBE7RkyiCVMW8/GobcG40EqGn  
grvjoMjWLj0IoJoeuZsv4ED7JjAbedGsA7WqGGzVTyyXbUVseSuYsb7eVy7I0VZF  
KiPI06KglRA9AQYPtnij3qku/RMQNWWrSjSSwUlM4FceY77GGo9BctQ7DdYS0M0a



ia2CYsL/nR12wRySdKzJOBmgBPDA+cFORwReVoBwGl4z1YB7jCBCpjKaB3zRrfwa  
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yT4U/URV1HgDgeKAy0sAkTeSAZsK08cRvhxDrpLL7y5w0fxFkSbN/04KujYb6YBe  
Z/aUF4VZeNeg7FEmpW6XAVSorFQ6DgMLmY2TyIIh5GswHwfcB7tqgYVYSieRM/ns  
GZ9hks9nsg6NlaL5ueYY0yGs8MB50XHDS42uK18fvRI8qA5liX/CkCdUJC5Hlu4i  
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wSSQb1utN5X/AZmKnF/65svl3IgngkLQIbFCCaD2IAzS5itRuTcbK+KZbKSCLNpg  
U/qYmuh0TDeHHM0126VEPQXAQnxvtV/0MobXpswmuo91PVsbFgCU2IA0JDILkI/a  
xwaCsoQSzTnw9qN5BVmIodbT1BBfoDorlC/C2HrkeD/J3+jSX/35Zbb9GnuLnLwU  
j/fQaGftHgt63pLqqMycYcVmiA0quvpMZYRmBGhHPyr+TcoLzkFNAsNswev6//U6  
hxWkF6SAaIVWF7hTAePbDqIyeVLm4s2S5Qhjw5IAsQokxff2C9GZTLDJpBLkv7oE  
r3HBt0Is6Y2CzkCH9nXfQvbw2LWEgsAgq4dLk3Z2NRct/LZAWF3E5a1wW4YRRH7j  
Ozl8aACWB6WnKnz82+1v2FcIFB9L8b0gNwU01u7sE1ayC2TQGzXAhu0riMtqBiJX  
bLmCos3/VelP2TodcI9HmrjSPH5HOWNP0h3M7VgXHbohm9Fg0Zf+0GNaSI4Hr/3X  
nvFuT6JgJUS4Nr9uE2RpZ1XDvLUVrW77tnLaqXMBLeHm/V/TXviqaxEEgtCSba  
iWgsWkhjk8JL/Oa/HBSA5mhf8Sq1ru46/sJXjRdZ1wXGEVmCoSkJmgKTn2a/8K1g  
XE1NMeTFZucz8WJDAC5DFvqthrHHcAcG8YMVTE4EzwfTrYe9dxHjILMDjP8A3Dx  
c7tlM/6g1c4nQTI471xs28i0sRw3upKY1T4S5MRqidQD2yKYbBVp0zMAwsybq0ay  
Bmugnz5xafztkADCg1mgQ4BzhXWz+0CMNj4txId3kMwGt7Qi20RDf7cDrv0S3krh  
LDGwGSl3fr9aaLISh6m62v7hg5Jn4wL2yXEGxAPj2TXzZwVGL9hmzbgthxt8pJM/u

HR2vMKohagn56K3xIfwi8QrWDBr9r80Kj2Ia88v2i/QeQe8Cq0Vu6yR8xAxGQFiw  
mJZ03enMPL00rRF9wdj33CxaF2q2kVysid59tPfJanTHUYz+IFV6/NsRfMgye0gV  
9k/ebq0x50IIjAjhlIfj/jyupnblUteAILhvNBfkqiDkWg9YhqD2MZxgIGuJod  
CLUq8fWt0iNV6WkStHZI402wMz3ek4YuIfyVrh+oxQcG6PihlwEu5wamZb2g0GDp  
tqa8AD7v/mezLHR4a2xogj9LDLz3RXH1RY0QHSbvVRebgjZrntOG+gidcbQvsB2e  
aS5X3SZXYQ0hbG4KACkwKWTj84Jxflp+KMfdybhVz9HneTtiLmSvlibPVj54ZuPc  
YNmELThyCxlsX61mmtydIAoitzN+YrB+MWx06KnPbWW18AsH/gWNX0qtYIRxJjY  
rZkvz0EOUgRBxdWuK9Fl0cbAfq6S3fIPMJycTlSal0A6ltq5XtjfozA2ckRutqV3  
1n+JM3Lo55CMe9igKfi4sEuIPmFjQQccxh85PMZKXZv+k+EU/PgD21HxWLbp1y1n  
lwSllaTC9kNAPlcvelR0fuM5jqilqDF6Q6w8pwem2m+vUc0aV0CBGJvvz8+Y76Bo  
fho7SD9SeB0nCsSxq1c0KaeWPl10Y001wUfI061oTbSya/tbNGGaE+pXzIbhKCvv  
w0TZ6t3+12dhZ0mx90zo1pxslASescGr4MDQePR6lecDPdgU6cJZMCzMiKrbZC1M  
lFlApbM5HdkJOG0AVxHvbBP5u5SSfu5GGDcjiVp27A8kLGB1x1JkFr/ayVqi0Zn  
7QUQu85CxW0nxqFFkYxXfvWVpPvbzorPySEntj+ZmwdqB6asqBuHoW+WEVf/U4Sp  
7YZ5c4Q6mP9/HZV3J+1b+BafuuR0p8lwuvYuITRpobOncr3+U4Pr77vdBbzYFm65  
kR5uZgS38rm3DX54qlUhb7AeWPnwqtEiaJA3soThkk+J4/GAIDM46cQaJdPfxikq  
AuZkkS0qjH0qEQR2gprYNTTAKISQXK3os+aSrdScZq87W55RQ4bW+1pwZjCnLEI5  
zTgzG2iWGCaPHZvoCV0cv+Ln14a+rplNBORdHhDuN5Vxnd8R3QFz7iL6WOW8XPuW

Vfhi1ZMHR8/e0rgqlF7nEw8B8XYydKsPRpYDnrjW0UA=

**B.3.9.** S/MIME encrypted and signed reply over a simple message,  
Injected Headers with hcp\_minimal (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 7845 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 4806 bytes
    ↓ (unwraps to)
    └ text/plain 435 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID:
  <smime-enc-signed-injected-minimal-legacy-reply@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:16:02 -0500
```

In-Reply-To:

<smime-enc-signed-injected-minimal-legacy@lhp.example>

References:

<smime-enc-signed-injected-minimal-legacy@lhp.example>

MIIWnAYJKoZIhvcNAQcDoIIWjTCCFokCAQAxggMQMIIBhAIBADBsmFUxDTALBgNV  
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTewLwYDVQQDEyhTYW1wbGUgTEFN  
UFMgU1NBIEIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00  
Boq0MA0GCSqGSIB3DQEBAQUABIIBAGNl0aq5o20JUxeEgaKipbTTomG9IBdUTU2t  
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5EqnQVxHA9IM69Epdiwk4IrQjep6dj isHGG61WLrc8tbIXgBM7QHKdrEA9yJuWFp  
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zGr07E5fvoqfFzBsYJp038zjw95tEOGUDeszdrGP2dPg16g5AjwwggGEAgEAMGww  
VTENMASGA1UEChMESUVURjERMA8GA1UEC xMITEFNUFMgV0cxMTAvBgNVBAMTKFNh  
bXBsZSBMQU1QUyBSU0EgQ2VydG lmaWNhdG l vbiBBdXRob3JpdHkCEzB8R0APH iY6  
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAG67SjjL4JZnZLqZM62xH8Cdz  
SGchx+Dpra0fE5ehEpY40Jy9j8sF6Wu21MLUNRZHQ+pU lNky7tA0DCIWcIbJlWV1  
PHfr/M0xf++3kfnJBFAj iGzp1R0htpeP5p+qt ky9VLxoArhI071rvEG0Z3u+6I05  
Z90Lz4jX5lzZvi6XIQLP3wtBxap1hQ6LBD3DWX3W2lCdKw0mKPhHQlwig0kXFWUV  
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1TTb/owfsyochfPx0ew4y/edwR0ayHmScjQ/ysa4ee5ehFnG691E1F0hKXJLozCC  
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**B.3.10.** S/MIME encrypted and signed reply over a simple message,  
 Wrapped Message with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a text/plain message. It uses the Wrapped Message header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```

└ application/pkcs7-mime [smime.p7m] 7605 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 4616 bytes
    ↓ (unwraps to)
    └ message/rfc822 810 bytes
      └ text/plain 325 bytes
  
```

Internet-Draft

Header Protection S/MIME

March 2022

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <0e210732-9184-5855-9a95-2a635560d3a6@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:17:02 -0500

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**B.3.11.** S/MIME encrypted and signed reply over a simple message,  
Injected Headers with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7  
envelopedData around signedData. The payload is a text/plain  
message. It uses the Injected Headers header protection scheme with  
the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 7565 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 4592 bytes
    ↓ (unwraps to)
    └─ text/plain 337 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <0b3ea6dd-0e91-5a91-9bc0-3d553f892983@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 10:18:02 -0500
```

```
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w7LgVMRJKMMDllquSaKDrQ==

**B.3.12.** S/MIME encrypted and signed reply over a simple message,  
Injected Headers with hcp\_strong (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7  
envelopedData around signedData. The payload is a text/plain  
message. It uses the Injected Headers header protection scheme with  
the hcp\_strong Header Confidentiality Policy with a "Legacy Display"  
part.

It has the following structure:

└ application/pkcs7-mime [smime.p7m] 7845 bytes  
  ↓ (decrypts to)  
    └ application/pkcs7-mime [smime.p7m] 4794 bytes  
      ↓ (unwraps to)  
        └ text/plain 431 bytes

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
  smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <b10dcc75-cf43-5fd7-9e48-f932a9d68fb5@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 10:19:02 -0500

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Header Protection S/MIME

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Gillmor, et al.

Expires 8 September 2022

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Internet-Draft

Header Protection S/MIME

March 2022

### [B.3.13.](#) S/MIME encrypted and signed over a complex message, Wrapped Message with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9470 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6002 bytes
    ↓ (unwraps to)
    └─ message/rfc822 1819 bytes
      └─ multipart/mixed 1755 bytes
        └─ multipart/alternative 1132 bytes
          └─ text/plain 375 bytes
            └─ text/html 473 bytes
              └─ image/png inline 232 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
```



Message-ID:

<smime-enc-signed-complex-wrapped-minimal@lhp.example>

From: Alice <alice@smime.example>

To: Bob <bob@smime.example>

Date: Sat, 20 Feb 2021 12:08:02 -0500

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Header Protection S/MIME

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**B.3.14.** S/MIME encrypted and signed over a complex message, Injected Headers with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9515 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6028 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 1785 bytes
      └─ multipart/alternative 1136 bytes
        └─ text/plain 387 bytes
          └─ text/html 482 bytes
            └─ image/png inline 236 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID:  
    <smime-enc-signed-complex-injected-minimal@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:09:02 -0500

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**B.3.15.** S/MIME encrypted and signed over a complex message, Injected Headers with hcp\_minimal (+ Legacy Display)



This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 10100 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6456 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 2094 bytes
        └─ multipart/alternative 1431 bytes
            ├── text/plain 485 bytes
            ├── text/html 637 bytes
            └─ image/png inline 236 bytes
```

Its contents are:

Gillmor, et al.

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```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID:
  <smime-enc-signed-complex-injected-minimal-legacy@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:10:02 -0500
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**B.3.16.** S/MIME encrypted and signed over a complex message, Wrapped Message with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```
└ application/pkcs7-mime [smime.p7m] 9470 bytes
  ↓ (decrypts to)
  └ application/pkcs7-mime [smime.p7m] 5994 bytes
    ↓ (unwraps to)
    └ message/rfc822 1813 bytes
      └ multipart/mixed 1749 bytes
        └ multipart/alternative 1128 bytes
          └ text/plain 373 bytes
          └ text/html 471 bytes
          └ image/png inline 232 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <95b9bb39-c028-5ff4-99b1-f179cb5d7585@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:11:02 -0500

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#### [B.3.17.](#) S/MIME encrypted and signed over a complex message, Injected Headers with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

└ application/pkcs7-mime [smime.p7m] 9490 bytes  
└ (decrypts to)

```

└─ application/pkcs7-mime [smime.p7m] 6020 bytes
  ↓ (unwraps to)
  └─ multipart/mixed 1779 bytes
    └─ multipart/alternative 1132 bytes
      └─ text/plain 385 bytes
      └─ text/html 480 bytes
      └─ image/png inline 236 bytes

```

Its contents are:

```

Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <23abef5f-8781-5c95-a46c-61e3a4464d58@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:12:02 -0500

```

```

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### B.3.18. S/MIME encrypted and signed over a complex message, Injected Headers with hcp\_strong (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

```

└─ application/pkcs7-mime [smime.p7m] 10075 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6444 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 2086 bytes
      └─ multipart/alternative 1425 bytes
        └─ text/plain 481 bytes
          └─ text/html 633 bytes
            └─ image/png inline 236 bytes

```

Its contents are:

```

Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <9cfcaae2-9fec-5aca-9a29-c98da35b262d@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:13:02 -0500

```

```

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**B.3.19.** S/MIME encrypted and signed reply over a complex message,  
Wrapped Message with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Wrapped Message header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9775 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6222 bytes
    ↓ (unwraps to)
    └─ message/rfc822 1978 bytes
      └─ multipart/mixed 1914 bytes
        └─ multipart/alternative 1144 bytes
          └─ text/plain 381 bytes
```

└─ text/html 479 bytes  
└─ image/png inline 232 bytes

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID:  
<smime-enc-signed-complex-wrapped-minimal-reply@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:14:02 -0500  
In-Reply-To:  
<smime-enc-signed-complex-wrapped-minimal@lhp.example>  
References:  
<smime-enc-signed-complex-wrapped-minimal@lhp.example>

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[B.3.20](#). S/MIME encrypted and signed reply over a complex message,  
Injected Headers with hcp\_minimal

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9815 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6250 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 1946 bytes
        └─ multipart/alternative 1148 bytes
            └─ text/plain 393 bytes
            └─ text/html 488 bytes
            └─ image/png inline 236 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID:
  <smime-enc-signed-complex-injected-minimal-reply@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:15:02 -0500
In-Reply-To:
  <smime-enc-signed-complex-injected-minimal@lhp.example>
References:
  <smime-enc-signed-complex-injected-minimal@lhp.example>
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**B.3.21.** S/MIME encrypted and signed reply over a complex message,  
Injected Headers with hcp\_minimal (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_minimal Header Confidentiality Policy with a "Legacy Display" part.

It has the following structure:

- └ application/pkcs7-mime [smime.p7m] 10445 bytes
- └ (decrypts to)
- └ application/pkcs7-mime [smime.p7m] 6720 bytes

```

└ (unwraps to)
  └ multipart/mixed 2283 bytes
    └ multipart/alternative 1455 bytes
      └ text/plain 497 bytes
      └ text/html 649 bytes
    └ image/png inline 236 bytes

```

Its contents are:

```

Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <smime-enc-signed-complex-injected-minimal-legacy-reply@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:16:02 -0500
In-Reply-To:
  <smime-enc-signed-complex-injected-minimal-legacy@lhp.example>
References:
  <smime-enc-signed-complex-injected-minimal-legacy@lhp.example>

```

```

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**B.3.22.** S/MIME encrypted and signed reply over a complex message,  
Wrapped Message with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7  
envelopedData around signedData. The payload is a multipart/  
alternative message with an inline image/png attachment. It uses the  
Wrapped Message header protection scheme with the hcp\_strong Header  
Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9750 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6210 bytes
    ↓ (unwraps to)
    └─ message/rfc822 1970 bytes
      └─ multipart/mixed 1906 bytes
        └─ multipart/alternative 1140 bytes
          └─ text/plain 379 bytes
            └─ text/html 477 bytes
              └─ image/png inline 232 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <38a0b7ba-76e0-5351-93e9-f44877e20e6e@lhp.example>  
From: Alice <alice@smime.example>



To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:17:02 -0500

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Gillmor, et al.

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**B.3.23.** S/MIME encrypted and signed reply over a complex message,  
Injected Headers with hcp\_strong

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy.

It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 9795 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6238 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 1938 bytes
        └─ multipart/alternative 1144 bytes
            └─ text/plain 391 bytes
            └─ text/html 486 bytes
            └─ image/png inline 236 bytes
```

Its contents are:

Content-Transfer-Encoding: base64  
Content-Type: application/pkcs7-mime; name="smime.p7m";  
smime-type="enveloped-data"  
Subject: [...]  
Message-ID: <c6774fdb-3ef5-5293-ab2d-eca8b66b4bbf@lhp.example>  
From: Alice <alice@smime.example>  
To: Bob <bob@smime.example>  
Date: Sat, 20 Feb 2021 12:18:02 -0500

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[B.3.24.](#) S/MIME encrypted and signed reply over a complex message,  
Injected Headers with hcp\_strong (+ Legacy Display)

This is a encrypted and signed S/MIME message using PKCS#7 envelopedData around signedData. The payload is a multipart/alternative message with an inline image/png attachment. It uses the Injected Headers header protection scheme with the hcp\_strong Header Confidentiality Policy with a "Legacy Display" part.

Gillmor, et al.

Expires 8 September 2022

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It has the following structure:

```
└─ application/pkcs7-mime [smime.p7m] 10425 bytes
  ↓ (decrypts to)
  └─ application/pkcs7-mime [smime.p7m] 6704 bytes
    ↓ (unwraps to)
    └─ multipart/mixed 2273 bytes
        └─ multipart/alternative 1449 bytes
            └─ text/plain 493 bytes
            └─ text/html 645 bytes
            └─ image/png inline 236 bytes
```

Its contents are:

```
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-mime; name="smime.p7m";
  smime-type="enveloped-data"
Subject: [...]
Message-ID: <acced3c9-111b-5a4f-bd80-34558da32b4d@lhp.example>
From: Alice <alice@smime.example>
To: Bob <bob@smime.example>
Date: Sat, 20 Feb 2021 12:19:02 -0500
```

```
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## [Appendix C](#). Additional information

### [C.1](#). Stored Variants of Messages with Bcc

Messages containing at least one recipient address in the Bcc header field may appear in up to three different variants:

1. The Message for the recipient addresses listed in To or Cc header fields, which must not include the Bcc header field neither for signature calculation nor for encryption.

2. The Message(s) sent to the recipient addresses in the Bcc header field, which depends on the implementation:
  - a) One Message for each recipient in the Bcc header field separately, with a Bcc header field containing only the address of the recipient it is sent to.
  - b) The same Message for each recipient in the Bcc header field with a Bcc header field containing an indication such as "Undisclosed recipients", but no addresses.
  - c) The same Message for each recipient in the Bcc header field which does not include a Bcc header field (this Message is identical to 1. / see above).
3. The Message stored in the 'Sent'-Folder of the sender, which usually contains the Bcc unchanged from the original Message, i.e., with all recipient addresses.

The most privacy preserving method of the alternatives (2a, 2b, and 2c) is to standardize 2a, as in the other cases (2b and 2c), information about hidden recipients is revealed via keys. In any case, the Message has to be cloned and adjusted depending on the recipient.

#### [Appendix D.](#) Examples

This section offers example cryptographic payloads (the content within the cryptographic envelope) that contain Legacy Display elements.

##### [D.1.](#) Example text/plain Cryptographic Payload with Legacy Display Elements

Here is a simple one-part Cryptographic Payload (headers and body) of a message that includes Legacy Display elements:

Date: Fri, 21 Jan 2022 20:40:48 -0500  
From: Alice <alice@example.net>  
To: Bob <bob@example.net>  
Subject: Dinner plans  
Message-ID: <text-plain-legacy-display@lhp.example>  
MIME-Version: 1.0  
Content-Type: text/plain; charset="us-ascii"; hp-legacy-display="1";  
protected-headers="v1"

Subject: Dinner plans

Let's meet at Rama's Roti Shop at 8pm and go to the park  
from there.

A compatible MUA will recognize the hp-legacy-display="1" parameter  
and render the body of the message as:

Let's meet at Rama's Roti Shop at 8pm and go to the park  
from there.

A legacy decryption-capable MUA that is unaware of this mechanism  
will ignore the hp-legacy-display="1" parameter and instead render  
the body including the Legacy Display elements:

Subject: Dinner plans

Let's meet at Rama's Roti Shop at 8pm and go to the park  
from there.

#### [D.2.](#) Example text/html Cryptographic Payload with Legacy Display Elements

Here is a modern one-part Cryptographic Payload (headers and body) of  
a message that includes Legacy Display elements:

Internet-Draft

Header Protection S/MIME

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```
Date: Fri, 21 Jan 2022 20:40:48 -0500
From: Alice <alice@example.net>
To: Bob <bob@example.net>
Subject: Dinner plans
Message-ID: <text-html-legacy-display@lhp.example>
MIME-Version: 1.0
Content-Type: text/html; charset="us-ascii"; hp-legacy-display="1";
  protected-headers="v1"
```

```
<html><head><title></title></head><body>
<div class="header-protection-legacy-display">
<pre>Subject: Dinner plans</pre>
</div>
<p>
Let's meet at Rama's Roti Shop at 8pm and go to the park
from there.
</p>
</body>
</html>
```

A compatible MUA will recognize the `hp-legacy-display="1"` parameter and mask out the Legacy Display div, rendering the body of the message as a simple paragraph:

Let's meet at Rama's Roti Shop at 8pm and go to the park from there.

A legacy decryption-capable MUA that is unaware of this mechanism will ignore the `hp-legacy-display="1"` parameter and instead render the body including the Legacy Display elements:

Subject: Dinner plans

Let's meet at Rama's Roti Shop at 8pm and go to the park from there.

## [Appendix E](#). Document Considerations

[[ RFC Editor: This section is to be removed before publication ]]



This draft is built from markdown source, and its development is tracked in a git repository (<https://gitlab.com/dkg/lamps-header-protection>).

You may also be interested in the latest editor's copy (<https://dkg.gitlab.io/lamps-header-protection/>).

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While minor editorial suggestions and nit-picks can be made as merge requests (<https://gitlab.com/dkg/lamps-header-protection>), please direct all substantive discussion to the LAMPS mailing list (<https://www.ietf.org/mailman/listinfo/spasm>) at [spasm@ietf.org](mailto:spasm@ietf.org).

## [Appendix F](#). Document Changelog

[[ RFC Editor: This section is to be removed before publication ]]

★ [draft-ietf-lamps-header-protection-08](#)

- MUST compose injected headers, MAY compose wrapped messages
- MUST parse both schemes
- cleanup and restructure document

★ [draft-ietf-lamps-header-protection-07](#)

- move from legacy display MIME part to legacy display elements within main body part

★ [draft-ietf-lamps-header-protection-06](#)

- document observed problems with legacy MUAs
- avoid duplicated outer Message-IDs in hcp\_strong test vectors

★ [draft-ietf-lamps-header-protection-05](#)

- fix multipart/signed wrapped test vectors

★ [draft-ietf-lamps-header-protection-04](#)

- add test vectors
- add "problems with Injected Messages" subsection
- \* [draft-ietf-lamps-header-protection-03](#)
  - dkg takes over from Bernie as primary author
  - Add Usability section
  - describe two distinct formats "Wrapped Message" and "Injected Headers"
  - Introduce Header Confidentiality Policy model

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- Overhaul message composition guidance
- Simplify document creation workflow, move public face to gitlab
- \* [draft-ietf-lamps-header-protection-02](#)
  - editorial changes / improve language
- \* [draft-ietf-lamps-header-protection-01](#)
  - Add DKG as co-author
  - Partial Rewrite of Abstract and Introduction [HB/AM/DKG]
  - Adding definitions for Cryptographic Layer, Cryptographic Payload, and Cryptographic Envelope (reference to [\[I-D.ietf-lamps-e2e-mail-guidance\]](#)) [DKG]
  - Enhanced MITM Definition to include Machine- / Meddler-in-the-middle [HB]
  - Relaxed definition of Original message, which may not be of type "message/rfc822" [HB]
  - Move "memory hole" option to the Appendix (on request by Chair to only maintain one option in the specification) [HB]

- Updated Scope of Protection Levels according to WG discussion during IETF-108 [HB]
- Obfuscation recommendation only for Subject and Message-Id and distinguish between Encrypted and Unencrypted Messages [HB]
- Removed (commented out) Header Field Flow Figure (it appeared to be confusing as it was) [HB]
- \* [draft-ietf-lamps-header-protection-00](#)
  - Initial version (text partially taken over from [\[I-D.ietf-lamps-header-protection-requirements\]](#))

## [Appendix G](#). Open Issues

[ [ RFC Editor: This section should be empty and is to be removed before publication. ] ]

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- \* Ensure "protected header" (Ex-Memory-Hole) option is (fully) compliant with the MIME standard, in particular also [\[RFC2046\]](#), [Section 5.1](#). (Multipart Media Type).
- \* Decide on whether or not merge requirements from [\[I-D.ietf-lamps-header-protection-requirements\]](#) into this document.
- \* Decide on whether or not specification for more legacy HP requirements should be added to this document.
- \* Verify ability to distinguish between Messages with Header Protection as specified in this document and messages without header protection, and update receiving guidance accordingly.
- \* Privacy Considerations [Section 6](#)
- \* Security Considerations [Section 5](#)

## Authors' Addresses

Daniel Kahn Gillmor  
American Civil Liberties Union  
125 Broad St.  
New York, NY, 10004  
United States of America  
Email: dkg@fifthhorseman.net

Bernie Hoeneisen  
pEp Foundation  
Oberer Graben 4  
CH- CH-8400 Winterthur  
Switzerland  
Email: bernie.hoeneisen@pep.foundation  
URI: <https://pep.foundation/>

Alexey Melnikov  
Isode Ltd  
14 Castle Mews  
Hampton, Middlesex  
TW12 2NP  
United Kingdom  
Email: alexey.melnikov@isode.com