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Header Protection for S/MIME

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.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on 8 September 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.

This document aims for backward compatibility with legacy clients to 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.

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.

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 Cryptograhic 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]):

            o If hcp(h,v) is not v:

                o Append (h,v) to ldlist

- -If ldlist is not empty:

    - oIdentify each leaf MIME part of payload that represents the "main body" of the message.

    - oFor each "Main Body Part" bodypart of type text/plain or text/html:

        - oInsert 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)

        - oAdd 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:

        - oLet newval be hcp(h,v)

        - oIf newval is not null:

            - oAdd 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:

```
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 element annotated with a class attribute of header-protection-legacy-display.

The content and formatting of this decorative 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 .

The annotated 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.

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:

-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:

oLet newval be hcp(h,v)

oIf newval is not null:

oAppend (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.

[[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.

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 with 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:

* 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 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]
L   └─┬ multipart/alternative [Rendered Body]
M    ├─ text/plain
N    └─ 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]
R    └─┬ multipart/alternative [Rendered Body]
S     ├─ text/plain
T     └─ 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 mssages 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:

* 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].

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.]]

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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

MIILFwYJKoZIhvcNAQcCoIILCDCCCwQCAQExDTALBglghkgBZQMEAgEwggFABgkq
hkiG9w0BBwGgggExBIIBLU1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6
IHRleHQvcGxhaW47IGNoYXJzZXQ9InV0Zi04Ig0KQ29udGVudC1UcmFuc2Zlci1F
bmNvZGluZzogN2JpdA0KDQpUaGlzIGlzIHRoZSBzbWltZS1vbmUtcGFydCBtZXNz
YWdlLg0KDQpUaGlzIGlzIGEgc2lnbmVkLW9ubHkgUy9NSU1FIG1lc3NhZ2Ugdmlh
IFBLQ1MjNyBzaWduZWREYXRhLiAgVGhlDQpwYXlsb2FkIGlzIGEgdGV4dC9wbGFp
biBtZXNzYWdlLiBJdCB1c2VzIG5vIGhlYWRlciBwcm90ZWN0aW9uLg0KDQotLSAN
CkFsaWNlDQphbGljZUBzbWltZS5leGFtcGxlDQqgggemMIIDzzCCAregAwIBAgIT
Dy0lvRE5l0rOQlSHoe49NAaKtDANBgkqhkiG9w0BAQ0FADBVMQ0wCwYDVQQKEwRJ
RVRGMREwDwYDVQQLEwhMQU1QUyBXRzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJT
QSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eTAgFw0xOTExMjAwNjU0MThaGA8yMDUy
MDkyNzA2NTQxOFowOzENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
FzAVBgNVBAMTDkFsaWNlIExvdmVsYWNlMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8A
MIIBCgKCAQEAmpUp+ovBouOP6AFQJ+RpwpODxxzY60n1lJ53pTeNSiJlWkwtw/cx
Qq0t4uD2vWYB8gOUH/CVt2Zp1c+auzPKJ2Zu5mY6kHm+hVB+IthjLeI7Htg6rNeu
Xq50/TuTSxX5R1I1EXGt8p6hAQVeA5oZ2afHg4b97enV8gozR0/Nkug4AkXmbk7T
HNc8vvjMUJanZ/VmS4TgDqXjWShplcI3lcvvBZMswt41/0HJvmSwqpS6oQcAx3We
ag0yCNj1V9V9yu/3DjcYbwW2lJf5NbMHbM1LY4X5chWfNEbkN6hQury/zxnlsukg
n+fHbqvwDhJLAgFpW/jA/EB/WI+whUpqtQIDAQABo4GvMIGsMAwGA1UdEwEB/wQC
MAAwFwYDVR0gBBAwDjAMBgpghkgBZQMCATABMB4GA1UdEQQXMBWBE2FsaWNlQHNt
aW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYIKwYBBQUHAwQwDgYDVR0PAQH/BAQDAgUg
MB0GA1UdDgQWBBSiU0HVRDyAKRV8ASPw546vzfN3DzAfBgNVHSMEGDAWgBSRMI58
BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG9w0BAQ0FAAOCAQEAgUl4oJyxMpwWpAyl
OvK6NEbMl1gD5H14EC4Muxq1u0q2XgXOSBHI6DfX/4LDsfx7fSIus8gWVY3WqMeu
OA7IizkBD+GDEu8uKveERRXZncxGwy2MfbH1Ib3U8QzTjqB8+dz2AwYeMxODWq9o
pwtA/lTOkRg8uuivZfg/m5fFo/QshlHNaaTDVEXsU4Ps98Hm/3gznbvhdjFbZbi4
oZ3tAadRlE5K9JiQaJYOnUmGpfB8PPwDR6chMZeegSQAW++OIKqHrg/WEh4yiuPf
qmAvX2hZkPpivNJYdTPUXTSO7K459CyqbqG+sNOo2kc1nTXl85RHNrVKQK+L0YWY
1Q+hWDCCA88wggK3oAMCAQICEzdBBXntdX9CqaJcOvT4as6aqdcwDQYJKoZIhvcN
AQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNV
BAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkwIBcN
MTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIw
DQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBALT0iehYOBY+TZp/T5K2KNI05Hwr
+E3wP6XTvyi6WWyTgBK9LCOwI2juwdRrjFBSXkk7pWpjXwsA3A5GOtz0FpfgyC7O
xsVcF7q4WHWZWleYXFKlQHJD73nQwXP968+A/3rBX7PhO0DBbZnfitOLPgPEwjTt
dg0VQQ6Wz+CRQ/YbHPKaw7aRphZO63dKvIKp4cQVtkWQHi6syTjGsgkLcLNau5LZ
DQUdsGV+SAo3nBdWCRYV+I65x8Kf4hCxqqmjV3d/2NKRu0BXnDe/N+iDz3X0zEoj
0fqXgq4SWcC0nsG1lyyXt1TL270I6ATKRGJWiQVCCpDtc0NT6vdJ45bCSzsCAwEA
AaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUDAgEwATAe
```

BgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUF
BwMEMA4GA1UdDwEB/wQEAwIGwDAdBgNVHQ4EFgQUu/bMsi0dBhIcl64papAQ0yBm
ZnMwHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZIhvcNAQEN
BQADggEBAHOJojanzqmgaSN3/gqSQ4cbbmdj/R40BEPr+gXT+xiidfZ2iLNwYyTn
euK6AChwKfnNvOFb8lV1iffRTF/KtmVEDMR/sYeqAH83KM5p3el2lVh4OHhyI0qN
uz5oShNaACSioQ23WxHGVy9vsdVfnbhsplrWg9NQ2WbpCmK+2oMh2oYl0Z/wvXMt
9cG6jbMvcdH4z0IOvg6mrYkKTM/RCGnumghxwYToj1OyD5Gs4D2IJCw+fX5ODxh5
2MbNRYXTus2ZPRPM8JXNQC4GWv4km3M4rKnJDd6hnoQ9rNeozIcBVyybQYjfrgg4
DRvw9Ksk22OH4ConlB8f7R7s1LM2cSYxggIAMIIB/AIBATBsMFUxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMg
UlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhM3QQV57XV/QqmiXDr0+GrOmqnX
MAsGCWCGSAFlAwQCAaBpMBgGCSqGSIb3DQEJAzELBgkqhkiG9w0BBwEwHAYJKoZI
hvcNAQkFMQ8XDTIxMDIyMDE1MDEwMlowLwYJKoZIhvcNAQkEMSIEIESMi+9/LUlD
fGjj+6U50VNLFxbzvyVJ0wzwnTS114DyMA0GCSqGSIb3DQEBAQUABIIBACJHeayB
UllC4GdcgdojTUjoeIy6UIbrSg/aKZgAkCB8Dwq0hdU10qiun6WKI/TxM5izpRvL
UsNBGmqknPBMFhvwX6KCrwFk0p0j5Y5DZqX30deiQiGTUv3NiwZGTrKJ3JkyymFO
HGbe5Thrq3inRLVfilEuIZewaJsnJhKfnEq9fS09icTJ5olPDAH6mZbW6hpYmU3F
KBk2qJNqJX6bo60rCogu3wXDj0wxnqEXmeNDH5/+L9UVZur+EWzviUc8Ldd/kP3L
DOO7ivs10bAWe8Tbw7NjuP8ZlVvzcvj3nXWzZzxh2ymDIOvyJA+t0LHQvsN/fbdW
fC6Pm51fEkabbmw=

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"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCCc0CAQExDTALBglghkgBZQMEAgEwCwYJKoZI
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJ
KoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3Jp
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk
acKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz
yidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOa
Gdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXC
N5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz
B2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK
arUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj
8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZI
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4F
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMt
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8
```

```
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV5
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENl
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQ
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgE
ykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAX
BgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUu
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD
VR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOH
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp
7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cml0eQITN0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTAyMDJa
MC8GCSqGSIb3DQEJBDEiBCBBQlio2vX/u19qayJ1Cm1QL6VZY0fBeGz9o7nEzCRO
+zANBgkqhkiG9w0BAQEFAASCAQARvwKQYbbPuADZ7KqyO9LuESdEfBxOF80sHKNz
UXrHZo8JdKaKxr/cTAuzBvoTxsmqvzP3ItCBm+javqX22+tHTpqisz5jkoiWyNVS
e+F++YX8mXokgQpY26mZ+15Mv8pYYhptn6zdkRU1+QOwwlDCc6ykkCZeXyc+Hf7c
xqM6SqPMQ+G7wIF6P2jHCId8Xyl7sdbL0i6PjotesHU+7nQsCjgI/iVR/ubWUdFX
CTg8HVy4p683V3Y9DoRNP4MlUdmon8JasHDvA0240JcXxhJn1zEYa4gOnwgu3kh9
3Y+NeucYCT0bXCBq2RLVQSpdNZfScXKL9QvZ3FtB0r6Bmtky
```

--76c--

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

MIITXAYJKoZIhvcNAQcDoIITTTCCE0kCAQAxggMQMIIBhAIBADBsMFUxDTALBgNV
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAE1K2Qo2Ln5O6L9qgFnOdvuAuXnh2dLiYWIt
x7B9W2VMQCtrxTipZfUe+Y4oV/Rxifp4gChJ2lCgt6A4hHyApD1yNqmR1pCT+ky6
jOJlr907Jzy9nIADEjaeKTIHePPWEWPiF3Otlrvg25NobNAE/dzcSgaS+SHsfPgu
vW6gA+lfzdoOKIWNVl1AJfbDRw8DeDi5n8ZPLkb/gYteBpY5mC2Iu8TebZ5qstQH
i8G01K4xb6E7eMdXKx+gyDxox1P79E4q3dCKwYPK/C6B3AaY52WW55js9mb79OH5
6/XvIEez58lV4a9d0iY7g+aoARyTPE9Z79miRYT0aagyYhblb14wggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAWANrcGMnwYd7bg/TA9Wagm3q
dbiZLg3NxHQZRLRySCFHt5wGkq1XcD7bWYwF0hSKiI4AJxJapfGUDEpDk1FYBU4r
9zS/elrwCnhwpO9sLfbJPRVvMTgTZuCOaY25ovZWvWtkS9MRDH+WoM5SNTf4vHHu
kjcSx5hafbhyiC5pPLLTRyIjObYgKraIMBXix7XKtSR/G7uD+HSIzhYUXqY0q2uQ
w7XiijbRd4bq9zqBbXriYyhFdo/JsBnYckjmmKcTLp6DfYTEzILKBJOepEiY5X4J
0JPeFyGxs7WSKDp1JZLZtjbMwvtEuUAwZ+iXDr1x/rQhq7mZIWqIbG6QpxYX6zCC
EC4GCSqGSIb3DQEHATAdBglghkgBZQMEAQIEEBDwXZa6LrdPCgLubNCkd3qAghAA
kaaty8gkFo4+y5iWeOqsbZ9paegmFbiGsTQxrta64sj8znKQfQKz6/g055IcDixI
STqxPMV+w01jv6+Azoy9qJP29UTL0mXAP0LDionSBTn/4VAwBMSUDRus6jkq045K
UXxmIpcO3SeOnpCLksyij6QlnAO24SbKsBex7R5EXYXU7W1G/PCoz9SWlYrQuXJ9
cU5ONWldvYE4/WeD1m3pjv3XKLNEWiaUIVolKFRhR4v+FUedn6dlVYDgfJrH8xDC
kW9gQvI1ZBbnBOr/zkoDhMMKtTgTvmzLIauDEi2RWKzlvwCattvIkkrjt+SwWpvr
oc6i58XfCx/d0YHPp5AIU8pslawDtQXe5ecACY9J/K0OgX1G51HI+O2XMC9S9QYn
YPxA+CsRxmhKHzQv9au48aQwmLBkhkXZq7FCve8GTnCLdU5AmtP6ff59lga7+hfb
VSz+jSodBL1WnlIKw/lrBvXFem/A4mtY/W9y9EVhGyRFuhoZDCiGRo/bPsyDNZBS
WAsjHLI3NJeUgHFFcEn5xOwDmhmJOehzs712pqrzMd0VrT4hALvvhSGB7nybL5dR
pabbxtpBgqzlwu6eoX1jSh5bF8/RsAJ81dxvn8AWcFc8q81YfYOzjqf7ZnuumT10
18/rdepv/nfyiYCRhr2Eekj0F3bXjlTG1oeCNTuUPcNHVX6+hQ7FY2CJm9JCqNhL
7whKhq+kKJuPugHb1e5d2rJFkNHrMIJAga8QqKy9eqKct4gW5FFT70wyB15YToJb
qVxb3BEZ6u1shpZ9IGVzS0Jmvke+Ptze86it00fQIJWfrFqoag83GcCuQEyYEcIc
HXWFsZIbQ1UD2+YSWBOzRBUUuJ3U66w3J5oDAYfYnieFNPuP0dhaAMsu7QQfLSZa
T/GbSibQoFXcDx6MaZ5fbZ1iduvoZZfERNMe5vN+q/w9Lx5e8hf1EZmTNMuoRn9O
wfT/wuM06Cc8FR2Ft7QLu80jqePQ6tAYwvA5QOvpBN9A82DUWz0I9eRDl9+S8Z+I
QgjbPcZ0ACFqLCfbT6uzrKp2vGSrA+IcS89+qBB+sKbtWPgTrK7QlJgc7NpHGyhZ
BltAVXv4fPngqn+gSqGuerD/xmvszHMIIHq6Q4ADxbxDE4R0yoV2afXUVyAMo85Q
eNG5WJ83Z12msJqx1+1EUzzoQXxvrZHm0bMziCjV/P1cu/ChtmuemopRxkplLbJv
/mChRaKv9TotDy2Dwzf5N5Xy58gb/0ktMXMdGpYts9awYc742TCscrTqutBAXtNM
dXA0OyelkVHBBCRcoUEWWhUGQKYmK0NQIpxduJYcLLhkMI+2QfyfdkODplEtXbX9
LaZhPRi9osmmF0fnSkmt2mtD+W8uxBF7espDkUsidb8NiUtzBrSqTADQUIuAw5xG
```

```
322wFZ0DtpFM6nHpbYBfIGlIR4LyqTzyaSRJtMkMiDFgnMWrNF6pMsToo+4GbARO
MWM9mq4XSMrKAinqu7T8UGWOt9bMfMJrTrpfETgQCL4vur9nI1CbgcPWW14U2oBW
2lT1duS0o2eRpeGA93U6zF7BbCmlEqPK45Qmm78NwMcI9i4GgHSG2ssEn8URmv0L
qp9+UmkhvLT26dZtkB0wPMEVOIWx3e+F34eVzno5jAbiJxuUIdDPDwQg7xtrcLif
lRsaiGx7MtWsP6paqGBrYdHcXNt8P8k2ywNqRicTSThG0P09CNDWFwNaKa+9Ia7a
EnWoFmNoNm/IUH+wbRQUnT7oh0qU2mxdgMnygDhEELe1+4tGCTAPTbxSU3gxQyv0
w686bzZP9uGLoRfivmXKm73Wu0HtUefT1rNdPsJDfqEfo8mEY4EDMh+Fa50S9Yj6
SGe8X9jDaTEJLd+yL7xEvdEQ7FxHbqo7twj/g4Im0OeG2ngEchWlYcuOrlgog4bv
kWwcMhOCcQ/9242sgCTG/ATAV1ix0Z16/WCzzY60Zxk1eAlP3Ar9NiQHGuVClR0o
QxhlP/1KvyVMAQTtuEposNLUdXMydq8lVErFuopYej3NJOPE7eA4BeIXNyrhxqfX
j23tfb3/C4uHEmgjnfW1LZIjwWrOjoEZa2+lG+Si7YQWLLJWFNqEEH2rpxQMnwvx
282dIYpyY14PDLLN5nMltY8MeMaNp6Q8rOwTDozmmZ9RONzbKJL3FxSVENKgdJTf
v+gpLOvXou6qDdidAqxErGM0j68g8Rnsdw7Lj3FQH7JjLZiR3EQgGxRKDwTsV1rW
ODtsNyKBtHDBOn/zOFTmgTVpYol2x/kV22C1Wn9ZArHFgZDxDyDjjJqxJwHlgVdE
J+bUZ1C5DatXxvjpFhrTpUz1dvsTsq48cmepEiEnqYO/33uU7KIqjBxY527dagnR
q01ntVycY4wiLKjuJHHHy/b25ORyxS/x6nVYJsoRNXsvYCZ1zqHC7uh9eQStAyj6
zotbPet++u2REXKSwzhI+6mTCrFkfeHxt3BqTPAxHPxsZAmquayksNs8e94G5LnD
VLAbdtwuIdeuz3rDWObafnaOVXD8vzjoMpiZcYKubb9pdFQIdxpYXPyqwz2f+c8g
9VnLXajpwqByOPtLT5knKWMbsXJ5Gc8sNIGl1blYnj5ao+z6JNV2qqWA8dukpM5Q
/KwmBvR9/RijeIEPGoqRcwUi92fuvVJV7oZf2ZCCGMLw8W4pSrzfs/xdOJslrTgN
trDrAOKlraCKJQ5zHwZyg+c65KUe+5voj4WTu27g/vWTmPjF70htA+UIYcsNVYU9
yGuznj6x/2EV7rLsUTpMqMFN0s4dQl4Hhfr4gaoDROb7bOdkVtWAvwP4c18wlJA9
08X9kQNPqID0M0NOruz8JO8gyTIxyAmopnEDREvMT7JCGuwPM9YRE64pVPOZ1AZm
STC7LY11zMhZL+RvhwbWqjkKeKN3hQM4/45BHGFVgg6k5iobcv78lZHWO28SWila
dEgJLSobB9ieOTfrWqBrBBHjpaDwuyjS+QwjsF8SFLdRD5TY1IugUvW5Swnucikh
X1rK/FaRRQJGzUesrkN06LlpFiiRyW9nuDjdpaKV4P9pkEjHmtN3KF95LjJnXs+Z
07cF0sX2K7FY4GCfFxGPSsqbcR/6zAFHVPjgPGDH51yOTe05RWLhgGEWqt7mIeSD
ppJdnY1LDFK0AFbXAFnjxhNwlfJiLB4vdsFqxGSYXfAjns8vZR62PgSExxUMxrO6
P7oIAYisiU+9XuG40ok8RFCZgN2Qdy5oNDbYow8x3XR4BQu8+2sT9nLvJosjYNhT
8yHMhhAbJl5VWK1EaB2gMxmAISiCCkQQ4YlStMc/LUkl8XOdQmf9SF0L1puuGEpM
V3BhxNxCReiXA8ulMtnytw++lhl3qapALVu5OsJBQ2sqrhc7VhZTfiRQHr5s/i97
OrBb1ZHv48NblW+tsS0Vl+jW/7AMUvQO+j7wYDI8Q2GplujJ08iHxZw/YDjR+up4
bmQjK3xySaCi9Ef58KYOj0Y8ITvS61GMn0bCkL23UGNwISo2gPEcStdOksZtlvGX
X37skWsFPD3M85DqQeckjv3PFzGQL7ZZLUQmmYqwG43DKrDJSZld7VYHmTY0rrMj
gNo6iqzI+6Ygi81y14ZWTVeOFIH9tOKvjtuJz+90Qi9vEbDqF43+hiyWVg/aOke8
4TGy7BZp5j/+SCr78/LvTko/5gafEymhaQmmsR7hskt3AhjfTyUfq/cAtuIm39U2
MmXRwPdrzWASGy/lF0QnrgB0T85+ID58J9VaP78mI/BtKO20wWMTjbabR7J3Rn+8
KW4H6eewVWBqghCnsJQuqibbZeFDjFgJ9kIaTvGD0TBehpp9TidmppXM4Dl4J+V/
u7dSL257DzlKkk42gK4Cs0P1dZwe888KIABF38AZ8dnWtD492eYxA9We6NB2ru1o
K59oloZdn+slcF3DLfvVpyfkZ8o3EVgAPVXiDfHWuVp1gL8Cv5ahVlk9BJSD1CgC
Vwsm01V1E7QeNh3gNdQI88tu4wh5SVFk4U2cYI+dDMFUVDMzrUI3tKvWXNZOzn4V
Ce6Eu2JPIcCOYUwDHpsq5aj9BPKBguhQQybDpAAkgSZLwhzAD7rEvo8TU8gzZ2KZ
zH506GoFtU4oNinnrvyHX96/bG/VlizOE9YtQNyEfxxSOBsZD9jgd1pG4j/FDF1Z
Ib+KUUo8Y7GKlOu+l+/WIVcp0nIsyIC4zGdM6DThCT6nGrhKboduTgF5NRH/Hf03
Vrbj/ZarK0t1gzbzPgxotZiUfCVEuav9AVqxA2Zq5afs6bRfohqyFqwKHiYV19C4
m00v4HisEFDGG3f5+Zj/x6tnX9QxR81DOomUooh8aYs/iAz0nrKyux6GMHSlj8db
UbvQ+1VvNE3Fj0xu46HkKzGtFqpgXxzDLkE9e7NJ+Hw4tbOLfINQ0qS7iTcjMbwg
snexBuL6rf8NF28EdlqQzCPLZVhnOd1+KKJS7V/M8u/R/y22+IXzFSA2TlxhId09
IduZ3ByCz2HFJfVj7SameC3KANbRnBkdud1hclIBDS5Hhpqk4M8i3zmZRZWgLyjR
```

```
edtSaHuJAlHiKgAtQVeIzlL6Ilw3jVoHL0vOdISoQpoWWhejB9f47KRmUbdb5Pxb
Ot2ylXJKYFfoCQUs1xkNAyynSJAJ97yEAZm7aDmE4bjs33pz4L3nYxO/KUY6EB/E
eGgPk3Cdvt2JYY5BuFoxXYRKQgZ06c9mXzavJJXXWQUUB5k2QG0uyKPmwNr2sdJQ
A8ehhmgGws+7qXwZQEcNC3W0vmiGOBDYP3JVJPiNLFVQN9k8ClE7+0emFn2UcNyG
294hO1G0uBPAbCdhAyDnNpVj5RS0EgY647agQHyp/gjSt4XeoaCIKaalb4iGpT+C
4r2BqRcVUCdE3MRQFqiT6ccm+8h8eA7xtMB8c9OgUTEIKk/WSc0DUsCJB62Plgtj
KJ4xXQXTzzUCDMnACFp6mBTd3g2ZbnfHKSyJdAvPigVbA+Qhy2eWUTYpi6yjTIyT
eaQ2qafGppn85oLFkdgdmE3Ty1UxOpAsqLyNlNAa6YT3D/0Jl3VnfhFKlmywWIG6
Z2SLd0r07xoBUuAKHkFUuRauGYbVbU/Frmdylv6I9DhCqV/XEDa/tHOa/LWugvb+
x5A+g+kZiTiWRRLZYHungyjquAf/zeJsPYRoQEi4KHAQ30xCDk/dhWdhDBnUXT8P
hzMj8VN3yjQA1vMNA5uefj2/+MIkLkz6+XPl/lJNLFHYi+EERgxJ2mFm/s02h9NF
NhyWBsBtsEwi+rVbfcRRBpVjR5MwUohNHMGxwgj7rzvUkDe47ueXDP74j+JclO68
r4jQ3sob123uSYryDHBZxZSbwjFU2ufE8W+XL/NGwTw04alHZfKsH4x4ZbGqwunf
U4lkcOY/ijmuhL5mn2YYUE6w4oywZuLx5WCv2oAvQawMmNP9AeI1jcV9JiKa+8y0
sAa1LzD78Dg4FKO8t3d13Q==
```

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
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

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcElEQVR42uVTOxbA
MAgS739nO3TpRw20dqpbfARQEjOywiwYnCtkDKnbcLk66sqlT+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

MIIPHwYJKoZIhvcNAQcCoIIPEDCCDwwCAQExDTALBglghkgBZQMEAgEwggVIBgkq
hkiG9w0BBwGgggU5BIIFNU1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6
IG11bHRpcGFydC9taXhlZDsgYm91bmRhcnk9IjExMCINCg0KLS0xMTANCk1JTUUt
VmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6IG11bHRpcGFydC9hbHRlcm5hdGl2
ZTsgYm91bmRhcnk9IjE5MyINCg0KLS0xOTMNCkNvbnRlbnQtVHlwZTogdGV4dC9w
bGFpbjsgY2hhcnNldD0idXMtYXNjaWkiDQpNSU1FLVZlcnNpb246IDEuMA0KQ29u
dGVudC1UcmFuc2Zlci1FbmNvZGluZzogN2JpdA0KDQpUaGlzIGlzIHRoZSBzbWlt
ZS1vbmUtcGFydC1jb21wbGV4IG1lc3NhZ2UuDQoNClRoaXMgaXMgYSBzaWduZWQt
b25seSBTL01JTUUgbWVzc2FnZSB2aWEgUEtDUyM3IHNpZ25lZERhdGEuICBUaGUN
CnBheWxvYWQgaXMgYSBtdWx0aXBhcnQvYWx0ZXJuYXRpdmUgbWVzc2FnZSB3aXRo
IGFuIGlubGluZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMgbm8gaGVh
ZGVyIHByb3RlY3Rpb24uDQoNCi0tIA0KQWxpY2UNCmFsaWNlQHNtaW1lLmV4YW1w
bGUNCi0tMTkzDQpDb250ZW50LVR5cGU6IHRleHQvaHRtbDsgY2hhcnNldD0idXMt
YXNjaWkiDQpNSU1FLVZlcnNpb246IDEuMA0KQ29udGVudC1UcmFuc2Zlci1FbmNv
ZGluZzogN2JpdA0KDQo8aHRtbD48aGVhZD48dGl0bGU+PC90aXRsZT48L2hlYWQ+
PGJvZHk+DQo8cD5UaGlzIGlzIHRoZSA8Yj5zbWltZS1vbmUtcGFydC1jb21wbGV4
PC9iPiBtZXNzYWdlLjwvcD4NCjxwPlRoaXMgaXMgYSBzaWduZWQtb25seSBTL01J
TUUgbWVzc2FnZSB2aWEgUEtDUyM3IHNpZ25lZERhdGEuICBUaGUNCnBheWxvYWQg
aXMgYSBtdWx0aXBhcnQvYWx0ZXJuYXRpdmUgbWVzc2FnZSB3aXRoIGFuIGlubGlu
ZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMgbm8gaGVhZGVyIHByb3Rl
Y3Rpb24uPC9wPg0KPHA+PHR0PiDxici8+QWxpY2U8YnIvPmFsaWNlQHNtaW1l
LmV4YW1wbGU8L3R0PjwvcD4NCjwvYm9keT4NCjwvaHRtbD4NCi0tMTkzDQpDb250
MA0KQ29udGVudC1UeXBlOiBpbWFnZS9wbmcNCkNvbnRlbnQtVHJhbnNmZXItRW5j
b2Rpbmc6IGJhc2U2NA0KQ29udGVudC1EaXNwb3NpdGlvbjogaW5saW5lDQoNCmlW
Qk9SdzBLR2dvQUFBQU5TVWhFVWdBQUFCUUFBQUFVQ0FZQUFBQ05pUjBOQUFBQWNF
bEVRVlI0MnVWVE94YkENCk1BZ1M3MzluTzNUcFJ3MjBkcXBiZkFSUUVqT3l3aXdZ
bkN0a0RLbmJjTGs2NnNxbFQrenQ5Y2lka0UrNkt3a1oNCnNncnpmY3FWTXBMMmpv
MDQ0N2dZRHBlQXJrK09uSkhrSWhBZlRQUmljaWhBZjVZSnJ3N3ZqdjBaV1JXTS91
bGkNCnZkUGYxUVoya0REOXhwcGQ4d0FBQUFCSlJVNUVya0pnZ2c9PQ0KDQotLTEx
MC0tDQqggemMIIDzzCCAregAwIBAgITDy0lvRE5l0rOQlSHoe49NAaKtDANBgkq
hkiG9w0BAQ0FADBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEx
MC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0
eTAgFw0xOTExMjAwNjU0MThaGA8yMDUyMDkyNzA2NTQxOFowOzENMAsGA1UEChME
SUVURjERMA8GA1UECxMITEFNUFMgV0cxFzAVBgNVBAMTDkFsaWNlIExvdmVsYWNl
MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAmpUp+ovBouOP6AFQJ+Rp
wpODxxzY60n1lJ53pTeNSiJlWkwtw/cxQq0t4uD2vWYB8gOUH/CVt2Zp1c+auzPK
J2Zu5mY6kHm+hVB+IthjLeI7Htg6rNeuXq50/TuTSxX5R1I1EXGt8p6hAQVeA5oZ
2afHg4b97enV8gozR0/Nkug4AkXmbk7THNc8vvjMUJanZ/VmS4TgDqXjWShplcI3
lcvvBZMswt41/0HJvmSwqpS6oQcAx3Weag0yCNj1V9V9yu/3DjcYbwW2lJf5NbMH
bM1LY4X5chWfNEbkN6hQury/zxnlsukgn+fHbqvwDhJLAgFpW/jA/EB/WI+whUpq
```

tQIDAQABo4GvMIGsMAwGA1UdEwEB/wQCMAAwFwYDVR0gBBAwDjAMBgpghkgBZQMC
ATABMB4GA1UdEQQXMBWBE2FsaWNlQHNtaW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYI
KwYBBQUHAwQwDgYDVR0PAQH/BAQDAgUgMB0GA1UdDgQWBBSiU0HVRDyAKRV8ASPw
546vzfN3DzAfBgNVHSMEGDAWgBSRMI58BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG
9w0BAQ0FAAOCAQEAgUl4oJyxMpwWpAylOvK6NEbMl1gD5H14EC4Muxq1u0q2XgXO
SBHI6DfX/4LDsfx7fSIus8gWVY3WqMeuOA7IizkBD+GDEu8uKveERRXZncxGwy2M
fbH1Ib3U8QzTjqB8+dz2AwYeMxODWq9opwtA/lTOkRg8uuivZfg/m5fFo/QshlHN
aaTDVEXsU4Ps98Hm/3gznbvhdjFbZbi4oZ3tAadRlE5K9JiQaJYOnUmGpfB8PPwD
R6chMZeegSQAW++OIKqHrg/WEh4yiuPfqmAvX2hZkPpivNJYdTPUXTSO7K459Cyq
bqG+sNOo2kc1nTXl85RHNrVKQK+L0YWY1Q+hWDCCA88wggK3oAMCAQICEzdBBXnt
dX9CqaJcOvT4as6aqdcwDQYJKoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjER
MA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2Vy
dGlmaWNhdGlvbiBBdXRob3JpdHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5Mjcw
NjU0MThaMDsxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYD
VQQDEw5BbGljZSBMb3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoC
ggEBALT0iehYOBY+TZp/T5K2KNI05Hwr+E3wP6XTvyi6WWyTgBK9LCOwI2juwdRr
jFBSXkk7pWpjXwsA3A5GOtz0FpfgyC7OxsVcF7q4WHWZWleYXFKlQHJD73nQwXP9
68+A/3rBX7PhO0DBbZnfitOLPgPEwjTtdg0VQQ6Wz+CRQ/YbHPKaw7aRphZO63dK
vIKp4cQVtkWQHi6syTjGsgkLcLNau5LZDQUdsGV+SAo3nBdWCRYV+I65x8Kf4hCx
qqmjV3d/2NKRu0BXnDe/N+iDz3X0zEoj0fqXgq4SWcC0nsG1lyyXt1TL270I6ATK
RGJWiQVCCpDtc0NT6vdJ45bCSzsCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcG
A1UdIAQQMA4wDAYKYIZIAWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5l
eGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIGwDAdBgNV
HQ4EFgQUu/bMsi0dBhIcl64papAQ0yBmZnMwHwYDVR0jBBgwFoAUkTCOfAcXDKfx
CShlNhpnHGh29FkwDQYJKoZIhvcNAQENBQADggEBAHOJojanzqmgaSN3/gqSQ4cb
bmdj/R40BEPr+gXT+xiidfZ2iLNwYyTneuK6AChwKfnNvOFb8lV1iffRTF/KtmVE
DMR/sYeqAH83KM5p3el2lVh4OHhyI0qNuz5oShNaACSioQ23WxHGVy9vsdVfnbhs
plrWg9NQ2WbpCmK+2oMh2oYl0Z/wvXMt9cG6jbMvcdH4z0IOvg6mrYkKTM/RCGnu
mghxwYToj1OyD5Gs4D2IJCw+fX5ODxh52MbNRYXTus2ZPRPM8JXNQC4GWv4km3M4
rKnJDd6hnoQ9rNeozIcBVyybQYjfrgg4DRvw9Ksk22OH4ConlB8f7R7s1LM2cSYx
ggIAMIIB/AIBATBsMFUxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdH
MTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9y
aXR5AhM3QQV57XV/QqmiXDr0+GrOmqnXMAsGCWCGSAFlAwQCAaBpMBgGCSqGSIb3
DQEJAzELBgkqhkiG9w0BBwEwHAYJKoZIhvcNAQkFMQ8XDTIxMDIyMDE3MDEwMlow
LwYJKoZIhvcNAQkEMSIEIAiYlRaTjUNCbHnrieg64m3mMEmTRF8kqt5E8+ogUh5/
MA0GCSqGSIb3DQEBAQUABIIBAILQrmFl9ls0ehRVddBjQEsH5VnT+NxYWjofr2i0
w5OoB4RU3+6bPs2i5Y+IZvdnQTkfux+L/Rmy+cK5tlK8J9taLXm3/mJO/57tW+Cl
E9WSBFb1Ik29FHbTuTbrcSaE6Dr5zGwZBmlkcb3rx+AdYM8PMAhDd+ESwYwyjWk4
A7zRNEA1pD4XZdiz0a/kULobW9W3OKaQdJANQG0CX23puEW+wk9hzuuWX+IXeLwh
4R1kXSigeWxlu44jrBGOzkr/UjonxvpjBzyvlS6ltj0HekROzHy9tXEHyeP6BOzC
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
```

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcElEQVR42uVTOxbA
MAgS739nO3TpRw20dqpbfARQEjOywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ
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vdPf1QZ2kDD9xppd8wAAAABJRU5ErkJggg==

--831--

--e18
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-signature; name="smime.p7s"

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```
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OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
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9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzAyMDJa
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GvJIthBGOKFbOtWPpY+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:

```
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

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```

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XNp6pvLjvgZb9G2CgtgDMgsZqSRlDa71B6ktIvg1js0blZ4Tcn4APcdi5F2Tm6Uj
h7V01OozajrZ4VGJVYI6DsBRPfa5DY+l4f/ITDyONn9VBmnOlIQhwC1G4l1csAnW
L4T0bi2glMl3BdafBAR0H7RePm08oohRiV9gB3lm9OXy7t9tyMdmfJSKExALnc5/
aE+7QfadJ1uaKI8MvFbfkWKB6x5KD+XHjNQ0NHOewM3aloJUp2Ok6CiNp9yekVAb
w8cIhvODtQysXPMj/q+wnuieOzkYHt9I2TA+wc4Bq+p6ZFGbIZUBzmb21h8SRqUw
HXC6D2VSMCBFjIVpePbYB8TbgEkY60obahPfkiq4BN1SnJc9rGK3ueMOcXLwyp8j
5enxquno55PmmeSvyU9VS5vwcUiLoEggLfmc3l0/XVlVpyFUsl1y1KjhBh0YfSDf
R0wTA3fMRH8v9UVQlVcoNBS+FzXPk8wRm4Nbx0zQ/d6BqDeL25dvQw8qy0+CIntR
cMWV+BG5PIFFmL4N9fqw1iHyK6ccIhp9KpUuVrpTTmmE2DuuJJiO00lZU52DzaTg
GvRuEjZz/TryEYploSpya4iaNzqnaaWd/g4STf5EXzH192QBf7WJoct/EaioK+8T
hIpyR5qXBX0RK/+TlIT2+oOPFdEXXOI5II+0YTdYa+y1uV9qKnN3apBXS+7GLodr
fjOABQTpXkglp6d7CTJU5gJlR+xQjkOKMvuQJn1WzeN3pkEFKaC/9SwoL/olvs5+
uCpE5QWUXNuCPyd9us8/mNsXse69SNK/oF5/Zqn8NawfmQVMo8JaPWpWarqJXdoY
2Mt/UhmLgfrZ6QidZEQi6OPcLgNbbYY35VHGgYsHj8c07GYTo3p59lKC6xEotY92
9MyKOgM8fw3dfAbBPXA4TqyUm6kD1J2Fy1sMMkyfR5WnQDsR+/Vxq5k5bTlJ1ZRF
8FZHeWv5AItHWP8KknJv9yHpygUWgj1PtFTPI9JfC4OI4kTybfGkS67iIB72oojf
dLLyzdJ/WMy9HSlT6EncV0clQTVlsCpxvNMn7Wxt4BkYd0v8eLPm7d7saiwl38D5
TtHy3EgkOABsPPUoihuls1gJKoRq7hWT3CYf5UBCsa3Ocd7Qo2yKJNgDrRosp45j
X6u//xxA/LDXgrq+th28PN7i+E9ZkWHt16wdUbtFQBEOmpm5ZB3hq88mDk15v9vb
OnQnwGf6h3UWx/AzmPuRPu2C/7mEtB7/tUj9nqwCgjXIJ8oYhv2uD6IjoAZgRbwm
T7KoMb9T780h/0LealOBpZ2a9LZgNAIcDWWhb8fGcS537GIzIS6eZG31J2Pdb+ip
isCzrnRZmWJqR9MPhUq0lhTLEuxd0RnuqQE+VnYydNvDu0p3L5nfINK9vtGWybkc
XRFbJS23dc0vS6ug29jGzLzjODz/S6TTvo0qgl2heFVFdYzD/z1pw2dPQAlk+RhO
dAG0tDQCIyVr719e64j4ZbFjMNfE7QA+YJfMaQ1HlXEGQvF9oLA34dN9hiNAh2Ls
9ehAOIo7gs192SDDOwDHSmJJr27A/BdGGc4vC+t8Bc7hjFza2ixJ9VkIh1pa8ZU9
aNnNbLcnfb5l8/7DXgSpiVFncgsLaCZ3iORFxE/IsNX9+R0An0+y+r2mpdtDWg1w
69g+EMg4dJw8u7pTTW4J47TCAECjF3WVybl8YpvVmgVsrTIL/jDlNWq66JtH2yC7
Kcc7IF1neMYTpW033hDTKDcY271nz/BhdumwynboWzKTjyNuim6e/OdCKOJHT8YJ
8icUmzbOi8iYjAwhSqu6t8OZBYIT7oItqzfkQMKKLWwuguJsRa3P6OY9Gg7FUZno
PXjOCpNyGzY0hg5VVk6FV+thB11MYmlnG16D50UbrH4tgnzkUwpUCMrXLdWr7dfp
l9u77ICFSiWnIUTtah+s9TUULnBAL1TWyEN6dcqdtT2+HYzDN+FT9+HJsUabDIVP
9421qkTt5VlCWImXEPdeq4PqfE7LWtEA666xhpgzdnmmE35QHI/por/HS47TlxTV
38m+Laew31eEWGaiORbPI8XlNZqlfwjv39bpJH9nqMdaeY/kbgFCAsJyuW1nfJ4W
uiTUYsk0Cs9u70BdYYfo0+zdUgem+XM0epL9zH9gsKiJ4gfdbv8x0rmcXhIhaA/V
bRGj9MYxyBbCORCNCMt1OeX/GndLxj9azdHKugZdLzGTA0Dx84xRd9rDWOSxGv1/
bNVXqDqCaW7BcSiO8pAnWlvwQ+m/p2Wxkzi71uxJhhHX7M8/k6mdJmmrB6SRf6S2
4oc7ojwI6vXTexWry421uQcrQTOMIFutqna5NYRylICuC0vm3WdNuRLfN7Lkpafq
evbT4zaksQOuDFoXIGIQ8kJ6HTEOA+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.

It has the following structure:

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

Its contents are:

```
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

MIIMIwYJKoZIhvcNAQcCoIIMFDCCDBACAQExDTALBglghkgBZQMEAgEwggJMBgkq
hkiG9w0BBwGgggI9BIICOU1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6
IG1lc3NhZ2UvcmZjODIyOyBmb3J3YXJkZWQ9Im5vIg0KDQpNSU1FLVZlcnNpb246
IDEuMApDb250ZW50LVR5cGU6IHRleHQvcGxhaW47IGNoYXJzZXQ9InV0Zi04IgpD
b250ZW50LVRyYW5zZmVyLUVuY29kaW5nOiA3Yml0ClN1YmplY3Q6IHNtaW1lLW9u
ZS1wYXJ0LXdyYXBwZWQKTWVzc2FnZS1JRDogPHNtaW1lLW9uZS1wYXJ0LXdyYXBw
ZWRAbGhwLmV4YW1wbGU+CkZyb206IEFsaWNlIDxhbGljZUBzbWltZS5leGFtcGxl
PgpUbzogQm9iIDxib2JAc21pbWUuZXhhbXBsZT4KRGF0ZTogU2F0LCAyMCBGZWIg
MjAyMSAxMDowNDowMiAtMDUwMAoKVGhpcyBpcyB0aGUgc21pbWUtb25lLXBhcnQt
d3JhcHBlZCBtZXNzYWdlLgoKVGhpcyBpcyBhIHNpZ25lZC1vbmx5IFMvTUlNRSBt
ZXNzYWdlIHZpYSBQS0NTIzcgc2lnbmVkRGF0YS4gIFRoZQpwYXlsb2FkIGlzIGEg
dGV4dC9wbGFpbiBtZXNzYWdlLiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2Ug
aGVhZGVyCnByb3RlY3Rpb24gc2NoZW1lLgoKLS0gCkFsaWNlCmFsaWNlQHNtaW1l
LmV4YW1wbGUKoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQw
DQYJKoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMg
V0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRo
b3JpdHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNV
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3Zl
bGFjZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gB
UCfkacKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXP
mrszyidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEF
XgOaGdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41ko
aZXCN5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX
+TWzB2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iP
sIVKarUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZI
AWUDAgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQM
MAoGCCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkV
fAEj8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJ
KoZIhvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtK
tl4FzkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3M
RsMtjH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0
LIZRzWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXw
fDz8A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyu
OfQsqm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3
QQV57XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElF
VEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNB
IENlcnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIw
OTI3MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEX
MBUGA1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAw
ggEKAoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo
```

```
7sHUa4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+95
0MFz/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYW
Tut3SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfC
n+IQsaqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9
COgEykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIw
ADAXBgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21p
bWUuZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAw
HQYDVR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwH
Fwyn8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4K
kkOHG25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30Uxf
yrZlRAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HV
X524bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP
0Qhp7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+
JJtzOKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSz
NnEmMYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1Q
UyBXRzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1
dGhvcml0eQITN0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkq
hkiG9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTA0
MDJaMC8GCSqGSIb3DQEJBDEiBCCt+Ik56mZTd2mpSgOXM38dS7jM5alU2FDX9/58
cga1szANBgkqhkiG9w0BAQEFAASCAQCxKLkx5li14OIOcH2tcWqcsQilPLgQ30ck
qhJL2X9/Cl22ibOGNwL8w3qSEBeG1a+WtHw3bSqJx1ciRYcLs16ms23no5QoZ0pU
fRLmQuTEgObCf+syiTGnWLj8e+2aRVP1L9yEIbin6+hFyp4s393zYhdMOPAP2ruI
lg+BxoWXUjXso+8lPgqLawA+9KMI6tQZMnwI9LpGJmZfoSXdHWqWtjdotzZpqsKm
Ihr8DBKtUetqgZ2zqDO3zo3W2L6EmNM05BJUmqwAt/cN+X9kws5dAqtHDQhPNTa1
WUX0oTTkMzn1RAlOxfowEStSnfDOOzIqg+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.

--
Alice
alice@smime.example

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

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCCc0CAQExDTALBglghkgBZQMEAgEwCwYJKoZI
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJ
KoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3Jp
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk
acKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz
yidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOa
Gdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXC
N5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz
B2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK
```

arUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj
8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZI
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4F
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMt
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV5
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENl
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQ
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgE
ykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAX
BgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUu
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD
VR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOH
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp
7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cml0eQITN0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTA1MDJa
MC8GCSqGSIb3DQEJBDEiBCCcDIxr7wd3VCCz1VBG9nySvUJ/Fhzo26f78El/UUbj
jTANBgkqhkiG9w0BAQEFAASCAQBUmMGL40IZQmt3Nad/ymEUOLu3Dgfd/nYKuj6P
fjKYJFb9UhwtufZK9/WyVtytLsFJMYHZgUSWU3VbHk1L/cO0469Rbqo6CqlLRJPK
uN2Eul2UCa+3ovMIQ8g0NBflXrdfR0OVRqvfO91hLFkTxLfCDUG8ziRWOLWucgZg
zkVXqEzvFyOtsSbr3GAY817wWgl1+PTFchO4XF+rg7cNysKqGLtjxP9lN3PcURYv
TmooTPY46kheab7ZAzKqQI6go7somKmMqD7UsctMLSVZo+EX5/N9vq5znv7bfpoE
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/sCAQExDTALBglghkgBZQMEAgEwggI3Bgkq
hkiG9w0BBwGgggIoBIICJE1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVRyYW5z
ZmVyLUVuY29kaW5nOiA3Yml0DQpTdWJqZWN0OiBzbWltZS1vbmUtcGFydC1pbmpl
Y3RlZA0KTWVzc2FnZS1JRDogPHNtaW1lLW9uZS1wYXJ0LWluamVjdGVkQGxocC5l
eGFtcGxlPg0KRnJvbTogQWxpY2UgPGFsaWNlQHNtaW1lLmV4YW1wbGU+DQpUbzog
Qm9iIDxib2JAc21pbWUuZXhhbXBsZT4NCkRhdGU6IFNhdCwgMjAgRmViIDIwMjEg
MTA6MDY6MDIgLTA1MDANCkNvbnRlbnQtVHlwZTogdGV4dC9wbGFpbjsgY2hhcnNl
dD0idXRmLTgiOyBwcm90ZWN0ZWQtaGVhZGVycz0idjEiDQoNClRoaXMgaXMgdGhl
IHNtaW1lLW9uZS1wYXJ0LWluamVjdGVkIG1lc3NhZ2UuDQoNClRoaXMgaXMgYSBz
aWduZWQtb25seSBTL01JTUUgbWVzc2FnZSB2aWEgUEtDUyM3IHNpZ25lZERhdGEu
ICBUaGUNCnBheWxvYWQgaXMgYSB0ZXh0L3BsYWluIG1lc3NhZ2UuIEl0IHVzZXMg
dGhlIEluamVjdGVkIEhlYWRlcnMgaGVhZGVyDQpwcm90ZWN0aW9uIHNjaGVtZS4N
Cg0KLS0gDQpBbGljZQ0KYWxpY2VAc21pbWUuZXhhbXBsZQ0KoIIHpjCCA88wggK3
oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJKoZIhvcNAQENBQAwVTENMAsG
A1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBM
QU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkwIBcNMTkxMTIwMDY1NDE4
WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExB
TVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIwDQYJKoZIhvcNAQEB
BQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfkacKTg8cc2OtJ9ZSed6U3jUoi
ZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrszyidmbuZmOpB5voVQfiLYYy3i
Ox7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOaGdmnx4OG/e3p1fIKM0dPzZLo
OAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXCN5XL7wWTLMLeNf9Byb5ksKqU
uqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWzB2zNS2OF+XIVnzRG5DeoULq8
v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVKarUCAwEAAaOBrzCBrDAMBgNV
HRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUDAgEwATAeBgNVHREEFzAVgRNh
bGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUFBwMEMA4GA1UdDwEB
/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj8OeOr83zdw8wHwYDVR0jBBgw
FoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZIhvcNAQENBQADggEBAIFJeKCc
sTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4FzkgRyOg31/+Cw7H8e30iLrPI
FlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMtjH2x9SG91PEM046gfPnc9gMG
HjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZRzWmkw1RF7FOD7PfB5v94M527
4XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8A0enITGXnoEkAFvvjiCqh64P
1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQsqm6hvrDTqNpHNZ015fOURza1
SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV57XV/QqmiXDr0+GrOmqnXMA0G
CSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdH
MTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9y
aXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4WjA7MQ0wCwYDVQQK
EwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUGA1UEAxMOQWxpY2UgTG92ZWxh
Y2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQC09InoWDgWPk2af0+S
tijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHUa4xQUl5JO6VqY18LANwORjrc
```

```
9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz/evPgP96wV+z4TtAwW2Z34rT
iz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3SryCqeHEFbZFkB4urMk4xrIJ
C3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQsaqpo1d3f9jSkbtAV5w3vzfo
g8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgEykRiVokFQgqQ7XNDU+r3SeOW
wks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAEEDAOMAwGCmCGSAFl
AwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUuZXhhbXBsZTATBgNVHSUEDDAK
BggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYDVR0OBBYEFLv2zLItHQYSHJeu
KWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn8QkoZTYaZxxodvRZMA0GCSqG
SIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOHG25nY/0eNARD6/oF0/sYonX2
doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZlRAzEf7GHqgB/NyjOad3pdpVY
eDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524bKZa1oPTUNlm6QpivtqDIdqG
JdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp7poIccGE6I9Tsg+RrOA9iCQs
Pn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtzOKypyQ3eoZ6EPazXqMyHAVcs
m0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEmMYICADCCAfwCAQEwbDBVMQ0w
CwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzExMC8GA1UEAxMoU2FtcGxl
IExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eQITN0EFee11f0Kpolw6
9Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG9w0BCQMxCwYJKoZIhvcNAQcB
MBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTA2MDJaMC8GCSqGSIb3DQEJBDEiBCA7
4grfze+Y7DQEGFAYHyyvRpNkuuZFR0V+RvSTvu4FGDANBgkqhkiG9w0BAQEFAASC
AQB1KYVvQNZpe3EKeM0XhJrlJNxneVmZWFCEl5YFeRsO8FeIwJkV65YtFJKjOVVy
qYuZBGz4MsKaddXxAOXI/Q7cJ+70d9iOc1mL3PD2/U6DOwwhNfJoNSK7miYfMASV
42TMJWTt0T1ORJnvBitjkTuZDus1tp3xwxbrZTa4pyGaXEhBW/Fc4z6L+z8hpQv/
+6dw3+ORgfc67VTHVnsVVfb0UPrWvdxFdL5xYdqXxlhDsLMEms2ttHHzvjC003Kq
As0xMHEmMpfdL5M69MAjvroOUv0SXETfQaxca7IKd+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.

--
Alice
alice@smime.example

--12b
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCCc0CAQExDTALBglghkgBZQMEAgEwCwYJKoZI
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJ
KoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3Jp
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk
acKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz
yidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOa
Gdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXC
N5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz
B2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK
arUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj
```

```
8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZI
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4F
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMt
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV5
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENl
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQ
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgE
ykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAX
BgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUu
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD
VR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOH
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp
7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cml0eQITN0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNTA3MDJa
MC8GCSqGSIb3DQEJBDEiBCCXRoUdgR7J+TnI6kw8MpGtWVJPCnoAB+XfkDf78dWi
cTANBgkqhkiG9w0BAQEFAASCAQCitU3JsEMd9FhqUu87UxYScDI1pDfZnX1vjges
xBmmSy5lq5vvs+axKK/hTOR7YLSuLJLNwxJgDCPEmHi1hV5Tpj5mLH8qEXu4c+kK
s9is53v0NvibhIvDEpnqNvL/kMVDAk2gTqYHCE2Ij7qcWWNhnGdweMJZsBvLy/Xi
BLaD2t4qHY9lPaeMugDrxThNWEhjoDIoI5f7NpBPYvJgB7b1cJhXqil5weYrJiGr
hyTr56lff+Xjs8qjgrrzdJ8HHeUsxDJulrX8auo+pIKudcu41U8Ben2M9nCiVbEG
aqbbPK7xip5c/YZEaZWYAs8w+dif68J8Eo7QO/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

MIIQOgYJKoZIhvcNAQcCoIIQKzCCECcCAQExDTALBglghkgBZQMEAgEwggZjBgkq
hkiG9w0BBwGgggZUBIIGUE1JTUUtVmVyc2lvbjogMS4wDQpDb250ZW50LVR5cGU6
IG1lc3NhZ2UvcmZjODIyOyBmb3J3YXJkZWQ9Im5vIg0KDQpNSU1FLVZlcnNpb246
IDEuMApDb250ZW50LVR5cGU6IG11bHRpcGFydC9taXhlZDsgYm91bmRhcnk9Ijhm
ZiIKU3ViamVjdDogc21pbWUtb25lLXBhcnQtY29tcGxleC13cmFwcGVkCk1lc3Nh
Z2UtSUQ6IDxzbWltZS1vbmUtcGFydC1jb21wbGV4LXdyYXBwZWRAbGhwLmV4YW1w
bGU+CkZyb206IEFsaWNlIDxhbGljZUBzbWltZS5leGFtcGxlPgpUbzogQm9iIDxi
b2JAc21pbWUuZXhhbXBsZT4KRGF0ZTogU2F0LCAyMCBGZWIgMjAyMSAxMjowNDow
MiAtMDUwMAoKLS04ZmYKTUlNRS1WZXJzaW9uOiAxLjAKQ29udGVudC1UeXBlOiBt
dWx0aXBhcnQvYWx0ZXJuYXRpdmU7IGJvdW5kYXJ5PSIxYWUiCgotLTFhZQpDb250
ZW50LVR5cGU6IHRleHQvcGxhaW47IGNoYXJzZXQ9InVzLWFzY2lpIgpNSU1FLVZl
cnNpb246IDEuMApDb250ZW50LVRyYW5zZmVyLUVuY29kaW5nOiA3Yml0CgpUaGlz
IGlzIHRoZSBzbWltZS1vbmUtcGFydC1jb21wbGV4LXdyYXBwZWQgbWVzc2FnZS4K
ClRoaXMgaXMgYSBzaWduZWQtb25seSBTL01JTUUgbWVzc2FnZSB2aWEgUEtDUyM3
IHNpZ25lZERhdGEuICBUaGUKcGF5bG9hZCBpcyBhIG11bHRpcGFydC9hbHRlcm5h
dGl2ZSBtZXNzYWdlIHdpdGggYW4gaW5saW5lIGltYWdlL3BuZwphdHRhY2htZW50
LiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2UgaGVhZGVyIHByb3RlY3Rpb24g
c2NoZW1lLgoKLS0gCkFsaWNlCmFsaWNlQHNtaW1lLmV4YW1wbGUKLS0xYWUKQ29u
dGVudC1UeXBlOiB0ZXh0L2h0bWw7IGNoYXJzZXQ9InVzLWFzY2lpIgpNSU1FLVZl
cnNpb246IDEuMApDb250ZW50LVRyYW5zZmVyLUVuY29kaW5nOiA3Yml0Cgo8aHRt
bD48aGVhZD48dGl0bGU+PC90aXRsZT48L2hlYWQ+PGJvZHk+CjxwPlRoaXMgaXMg
dGhlIDxiPnNtaW1lLW9uZS1wYXJ0LWNvbXBsZXgtd3JhcHBlZDwvYj4gbWVzc2Fn
ZS48L3A+CjxwPlRoaXMgaXMgYSBzaWduZWQtb25seSBTL01JTUUgbWVzc2FnZSB2
aWEgUEtDUyM3IHNpZ25lZERhdGEuICBUaGUKcGF5bG9hZCBpcyBhIG11bHRpcGFy
dC9hbHRlcm5hdGl2ZSBtZXNzYWdlIHdpdGggYW4gaW5saW5lIGltYWdlL3BuZwph
dHRhY2htZW50LiBJdCB1c2VzIHRoZSBXcmFwcGVkIE1lc3NhZ2UgaGVhZGVyIHBy
b3RlY3Rpb24gc2NoZW1lLjwvcD4KPHA+PHR0Pi0tIDxici8+QWxpY2U8YnIvPmFs
aWNlQHNtaW1lLmV4YW1wbGU8L3R0PjwvcD48L2JvZHk+PC9odG1sPgotLTFhZS0t
CgotLThmZgpDb250ZW50LVR5cGU6IGltYWdlL3BuZwpDb250ZW50LVRyYW5zZmVy
LUVuY29kaW5nOiBiYXNlNjQKQ29udGVudC1EaXNwb3NpdGlvbjogaW5saW5lCgpp
VkJPUncwS0dnb0FBQUFOU1VoRVVnQUFBQlFBQUFBVUNBWUFBQUNOaVIwTkFBQUFj
RWxFUVZSNDJ1VlRPeGJBCk1BZ1M3MzluTzNUcFJ3MjBkcXBiZkFSUUVqT3l3aXdZ
bkN0a0RLbmJjTGs2NnNxbFQrenQ5Y2lka0UrNkt3a1oKc2dyemZjcVZNcEwyam8w
NDQ3Z1lEcGVBcmsrT25KSGtJaEFmVFBSaWNpaEFmNVlKcnc3dmp2MFpXUldNL3Vs
aQp2ZFBmMVFaMmtERDl4cHBkOHdBQUFBQkpSVTVFcmtKZ2dnPT0KCi0tOGZmLS0K
oIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJKoZIhvcN
AQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNV
BAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkwIBcN
MTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFjZTCCASIw

DQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfkacKTg8cc
2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrszyidmbuZm
OpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOaGdmnx4OG
/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXCN5XL7wWT
LMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWzB2zNS2OF
+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVKarUCAwEA
AaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUDAgEwATAe
BgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoGCCsGAQUF
BwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj8OeOr83z
dw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZIhvcNAQEN
BQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4FzkgRyOg3
1/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMtjH2x9SG9
1PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZRzWmkw1RF
7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8A0enITGX
noEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQsqm6hvrDT
qNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV57XV/Qqmi
XDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYxETAPBgNV
BAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmlj
YXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4
WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUGA1UEAxMO
QWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQC0
9InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHUa4xQUl5J
O6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz/evPgP96
wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3SryCqeHE
FbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQsaqpo1d3
f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgEykRiVokF
QgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAE
EDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUuZXhhbXBs
ZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYDVR0OBBYE
FLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn8QkoZTYa
ZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOHG25nY/0e
NARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZlRAzEf7GH
qgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524bKZa1oPT
UNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp7poIccGE
6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtzOKypyQ3e
oZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEmMYICADCC
AfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzExMC8G
A1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eQIT
N0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG9w0BCQMx
CwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzA0MDJaMC8GCSqG
SIb3DQEJBDEiBCDMOILEox46FkWxHI/3mD5yDe0N8CAfZ/xaQnI0alyyOTANBgkq
hkiG9w0BAQEFAASCAQBWzuGAP7C0InZ86JeaKimYKXpArooRzZnso+wJtXhZlmTX
csHp783QCEKYE0F+rv1IrD+fcFULz8Lo7Mm+PWQbtkbx5uZR7IFLGlK+8i8wVCZj
1Bs2lgpZ/qg1qP+ddCPwZuywITEGnjjqg76OHJOgxJniG3/teIy6dHMI2OBogZjN
kdVSbBhOa9GnTtnWJd2zH7t0tV16NyH3+pNn4DTUWR2IvRgxHky/KT7cIOTfQj9C
HEizTljQMDvHhoHslWdwjAGjH3foH4CXP1/1bN+qBH2QAuRZ8+LueDcllQsPJXtc
fUseHVMstoHac0rajLjDZ8FXSLCkmto6RRSQVsT0

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.

--
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

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcElEQVR42uVTOxbA
MAgS739nO3TpRw20dqpbfARQEjOywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ
sgrzfcqVMpL2jo0447gYDpeArk+OnJHkIhAfTPRicihAf5YJrw7vjv0ZWRWM/uli
vdPf1QZ2kDD9xppd8wAAAABJRU5ErkJggg==

--c33--

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

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCCc0CAQExDTALBglghkgBZQMEAgEwCwYJKoZI
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJ
KoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3Jp
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk
acKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz
yidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOa
Gdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXC
N5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz
B2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK
arUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj
8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZI
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4F
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMt
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV5
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENl
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU
```

```
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQ
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgE
ykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAX
BgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUu
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD
VR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOH
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp
7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cml0eQITN0EFee11f0Kpolw69PhqzpqP1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzA1MDJa
MC8GCSqGSIb3DQEJBDEiBCAv+o7fTfRFOqnpRsH2sYzOleh5w2W+5q6Nde9GJQWH
nTANBgkqhkiG9w0BAQEFAASCAQBrqtTw1eU834PA6rF6Vsac5dGAswyv4vh/EVxO
xBY7A+uEacaMOXRaSzkTqehOkOGa31d2bV6XmWbcR9kNvradw//dXOkctHW/cW6x
1BALj1aFAbYmObCY/FTItu7nLGIAIQCm0W4OVHgH7I/QXOsz3o7hH68SWItJnLDy
cSEDzRKNh1vl5cN0euY0mNA6HcvKchkIlWCj1pcJVmTq3FQE4GNeeO1x2Pz3ao7y
vDO/E/s1iF2SiPS7GcgluywZ1ln5xAwR95/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
```


```
MIIQRwYJKoZIhvcNAQcCoIIQODCCEDQCAQExDTALBglghkgBZQMEAgEwggZwBgkq
hkiG9w0BBwGgggZhBIIGXU1JTUUtVmVyc2lvbjogMS4wDQpTdWJqZWN0OiBzbWlt
ZS1vbmUtcGFydC1jb21wbGV4LWluamVjdGVkDQpNZXNzYWdlLUlEOiA8c21pbWUt
b25lLXBhcnQtY29tcGxleC1pbmplY3RlZEBsaHAuZXhhbXBsZT4NCkZyb206IEFs
aWNlIDxhbGljZUBzbWltZS5leGFtcGxlPg0KVG86IEJvYiA8Ym9iQHNtaW1lLmV4
YW1wbGU+DQpEYXRlOiBTYXQsIDIwIEZlYiAyMDIxIDEyOjA2OjAyIC0wNTAwDQpD
b250ZW50LVR5cGU6IG11bHRpcGFydC9taXhlZDsgYm91bmRhcnk9IjVkYSI7IHBy
b3RlY3RlZC1oZWFkZXJzPSJ2MSINCg0KLS01ZGENCk1JTUUtVmVyc2lvbjogMS4w
DQpDb250ZW50LVR5cGU6IG11bHRpcGFydC9hbHRlcm5hdGl2ZTsgYm91bmRhcnk9
IjllYyINCg0KLS05ZWMNCkNvbnRlbnQtVHlwZTogdGV4dC9wbGFpbjsgY2hhcnNl
dD0idXMtYXNjaWkiDQpNSU1FLVZlcnNpb246IDEuMA0KQ29udGVudC1UcmFuc2Zl
ci1FbmNvZGluZzogN2JpdA0KDQpUaGlzIGlzIHRoZSBzbWltZS1vbmUtcGFydC1j
b21wbGV4LWluamVjdGVkIG1lc3NhZ2UuDQoNClRoaXMgaXMgYSBzaWduZWQtb25s
eSBTL01JTUUgbWVzc2FnZSB2aWEgUEtDUyM3IHNpZ25lZERhdGEuICBUaGUNCnBh
eWxvYWQgaXMgYSBtdWx0aXBhcnQvYWx0ZXJuYXRpdmUgbWVzc2FnZSB3aXRoIGFu
IGlubGluZSBpbWFnZS9wbmcNCmF0dGFjaG1lbnQuIEl0IHVzZXMgdGhlIEluamVj
dGVkIEhlYWRlcnMgaGVhZGVyIHByb3RlY3Rpb24gc2NoZW1lLg0KDQotLSANCkFs
aWNlDQphbGljZUBzbWltZS5leGFtcGxlDQotLTllYw0KQ29udGVudC1UeXBlOiB0
ZXh0L2h0bWw7IGNoYXJzZXQ9InVzLWFzY2lpIg0KTUlNRS1WZXJzaW9uOiAxLjAN
CkNvbnRlbnQtVHJhbnNmZXItRW5jb2Rpbmc6IDdiaXQNCg0KPGh0bWw+PGhlYWQ+
PHRpdGxlPjwvdGl0bGU+PC9oZWFkPjxib2R5Pg0KPHA+VGhpcyBpcyB0aGUgPGI+
c21pbWUtb25lLXBhcnQtY29tcGxleC1pbmplY3RlZDwvYj4gbWVzc2FnZS48L3A+
DQo8cD5UaGlzIGlzIGEgc2lnbmVkLW9ubHkgUy9NSU1FIG1lc3NhZ2UgdmlhIFBL
Q1MjNyBzaWduZWREYXRhLiAgVGhlDQpwYXlsb2FkIGlzIGEgbXVsdGlwYXJ0L2Fs
dGVybmF0aXZlIG1lc3NhZ2Ugd2l0aCBhbiBpbmxpbmUgaW1hZ2UvcG5nDQphdHRh
Y2htZW50LiBJdCB1c2VzIHRoZSBJbmplY3RlZCBIZWFkZXJzIGhlYWRlciBwcm90
ZWN0aW9uIHNjaGVtZS48L3A+DQo8cD48dHQ+LS0gPGJyLz5BbGljZTxici8+YWxp
Y2VAc21pbWUuZXhhbXBsZTwvdHQ+PC9wPjwvYm9keT48L2h0bWw+DQotLTllYy0t
DQoNCi0tNWRhDQpDb250ZW50LVR5cGU6IGltYWdlL3BuZw0KQ29udGVudC1UcmFu
c2Zlci1FbmNvZGluZzogYmFzZTY0DQpDb250ZW50LURpc3Bvc2l0aW9uOiBpbmxp
bmUNCg0KaVZCT1J3MEtHZ29BQUFBTlNVaEVVZ0FBQUJRQUFBQVVDQVlBQUFDTmlS
ME5BQUFBY0VsRVFWUjQydVZUT3hiQQ0KTUFnUzczOW5PM1RwUncyMGRxcGJmQVJR
RWpPeXdpd1luQ3RrREtuYmNMazY2c3FsVCt6dDljaWRrRSs2S3drWg0Kc2dyemZj
cVZNcEwyam8wNDQ3Z1lEcGVBcmsrT25KSGtJaEFmVFBSaWNpaEFmNVlKcnc3dmp2
MFpXUldNL3VsaQ0KdmRQZjFRWjJrREQ5eHBwZDh3QUFBQUJKUlU1RXJrSmdnZz09
DQoNCi0tNWRhLS0NCqCCB6YwggPPMIICt6ADAgECAhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYxETAPBgNVBAsTCExB
TVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENlcnRpZmljYXRpb24g
QXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3MDY1NDE4WjA7MQ0w
CwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUGA1UEAxMOQWxpY2Ug
```

TG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQCalSn6i8Gi
44/oAVAn5GnCk4PHHNjrSfWUnnelN41KImVaTC3D9zFCrS3i4Pa9ZgHyA5Qf8JW3
ZmnVz5q7M8onZm7mZjqQeb6FUH4i2GMt4jse2Dqs165ernT9O5NLFflHUjURca3y
nqEBBV4DmhnZp8eDhv3t6dXyCjNHT82S6DgCReZuTtMc1zy++MxQlqdn9WZLhOAO
peNZKGmVwjeVy+8FkyzC3jX/Qcm+ZLCqlLqhBwDHdZ5qDTII2PVX1X3K7/cONxhv
BbaUl/k1swdszUtjhflyFZ80RuQ3qFC6vL/PGeWy6SCf58duq/AOEksCAWlb+MD8
QH9Yj7CFSmq1AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAXBgNVHSAEEDAOMAwG
CmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUuZXhhbXBsZTATBgNV
HSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBSAwHQYDVR0OBBYEFKJTQdVE
PIApFXwBI/Dnjq/N83cPMB8GA1UdIwQYMBaAFJEwjnwHFwyn8QkoZTYaZxxodvRZ
MA0GCSqGSIb3DQEBDQUAA4IBAQCBSXignLEynBakDKU68ro0RsyXWAPkfXgQLgy7
GrW7SrZeBc5IEcjoN9f/gsOx/Ht9Ii6zyBZVjdaox644DsiLOQEP4YMS7y4q94RF
FdmdzEbDLYx9sfUhvdTxDNOOoHz53PYDBh4zE4Nar2inC0D+VM6RGDy66K9l+D+b
l8Wj9CyGUc1ppMNURexTg+z3web/eDOdu+F2MVtluLihne0Bp1GUTkr0mJBolg6d
SYal8Hw8/ANHpyExl56BJABb744gqoeuD9YSHjKK49+qYC9faFmQ+mK80lh1M9Rd
NI7srjn0LKpuob6w06jaRzWdNeXzlEc2tUpAr4vRhZjVD6FYMIIDzzCCAregAwIB
AgITN0EFee11f0Kpolw69Phqzpqp1zANBgkqhkiG9w0BAQ0FADBVMQ0wCwYDVQQK
EwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzExMC8GA1UEAxMoU2FtcGxlIExBTVBT
IFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhvcml0eTAgFw0xOTExMjAwNjU0MThaGA8y
MDUyMDkyNzA2NTQxOFowOzENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMg
V0cxFzAVBgNVBAMTDkFsaWNlIExvdmVsYWNlMIIBIjANBgkqhkiG9w0BAQEFAAOC
AQ8AMIIBCgKCAQEAtPSJ6Fg4Fj5Nmn9PkrYo0jTkfCv4TfA/pdO/KLpZbJOAEr0s
I7AjaO7B1GuMUFJeSTulamNfCwDcDkY63PQWl+DILs7GxVwXurhYdZlaV5hcUqVA
ckPvedDBc/3rz4D/esFfs+E7QMFtmd+K04s+A8TCNO12DRVBDpbP4JFD9hsc8prD
tpGmFk7rd0q8gqnhxBW2RZAeLqzJOMayCQtws1q7ktkNBR2wZX5ICjecF1YJFhX4
jrnHwp/iELGqqaNXd3/Y0pG7QFecN7836IPPdfTMSiPR+peCrhJZwLSewbWXLJe3
VMvbvQjoBMpEYlaJBUIKkO1zQ1Pq90njlsJLOwIDAQABo4GvMIGsMAwGA1UdEwEB
/wQCMAAwFwYDVR0gBBAwDjAMBgpghkgBZQMCATABMB4GA1UdEQQXMBWBE2FsaWNl
QHNtaW1lLmV4YW1wbGUwEwYDVR0lBAwwCgYIKwYBBQUHAwQwDgYDVR0PAQH/BAQD
AgbAMB0GA1UdDgQWBBS79syyLR0GEhyXrilqkBDTIGZmczAfBgNVHSMEGDAWgBSR
MI58BxcMp/EJKGU2GmccaHb0WTANBgkqhkiG9w0BAQ0FAAOCAQEAc4miNqfOqaBp
I3f+CpJDhxtuZ2P9HjQEQ+v6BdP7GKJ19naIs3BjJOd64roAKHAp+c284VvyVXWJ
99FMX8q2ZUQMxH+xh6oAfzcozmnd6XaVWHg4eHIjSo27PmhKE1oAJKKhDbdbEcZX
L2+x1V+duGymWtaD01DZZukKYr7agyHahiXRn/C9cy31wbqNsy9x0fjPQg6+Dqat
iQpMz9EIae6aCHHBhOiPU7IPkazgPYgkLD59fk4PGHnYxs1FhdO6zZk9E8zwlc1A
LgZa/iSbczisqckN3qGehD2s16jMhwFXLJtBiN+uCDgNG/D0qyTbY4fgKieUHx/t
HuzUszZxJjGCAgAwggH8AgEBMGwwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMI
TEFNUFMgV0cxMTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlv
biBBdXRob3JpdHkCEzdBBXntdX9CqaJcOvT4as6aqdcwCwYJYIZIAWUDBAIBoGkw
GAYJKoZIhvcNAQkDMQsGCSqGSIb3DQEHATAcBgkqhkiG9w0BCQUxDxcNMjEwMjIw
MTcwNjAyWjAvBgkqhkiG9w0BCQQxIgQgSnZFRpoKyudHBvkAo6hqyxtaGzBVpz8R
sk+FJtjH7PgwDQYJKoZIhvcNAQEBBQAEggEADAiUCPkW4o6qXePSs+Yh+ZPDq8Zy
v5hHlSNGGLmQP82ZDL/+zob54QvODTFnFb8SNL05nxIZlmZo/XtxRThlSiIy/Cnb
xL9dkylfOaOdtkc5MMv+W5AWQQ4CsJfkN+g9EPr+XcsFCn7Dsb/Vu836eZhSQ+tB
kttfKuhy/XKImI3fp5GLZhGu5NVWnwwC+lUm3AoKhmKhI3M8KCt84xpMGYXHJd1t
DfADNo6cWgQ0pQeF7mSh4gSneysep2koZNVx9LpCjoYzto6t5DorJBtBiZBr7qBg
jY68KcMpZ2N4IIPLtcup96bHPeR+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

iVBORw0KGgoAAAANSUhEUgAAABQAAAAUCAYAAACNiR0NAAAAcElEQVR42uVTOxbA
MAgS739nO3TpRw20dqpbfARQEjOywiwYnCtkDKnbcLk66sqlT+zt9cidkE+6KwkZ
sgrzfcqVMpL2jo0447gYDpeArk+OnJHkIhAfTPRicihAf5YJrw7vjv0ZWRWM/uli
vdPf1QZ2kDD9xppd8wAAAABJRU5ErkJggg==

--193--

--34f
Content-Transfer-Encoding: base64
Content-Type: application/pkcs7-signature; name="smime.p7s"

MIIJ4AYJKoZIhvcNAQcCoIIJ0TCCCc0CAQExDTALBglghkgBZQMEAgEwCwYJKoZI
hvcNAQcBoIIHpjCCA88wggK3oAMCAQICEw8tJb0ROZdKzkJUh6HuPTQGirQwDQYJ
KoZIhvcNAQENBQAwVTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cx
MTAvBgNVBAMTKFNhbXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3Jp
dHkwIBcNMTkxMTIwMDY1NDE4WhgPMjA1MjA5MjcwNjU0MThaMDsxDTALBgNVBAoT
BElFVEYxETAPBgNVBAsTCExBTVBTIFdHMRcwFQYDVQQDEw5BbGljZSBMb3ZlbGFj
ZTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJqVKfqLwaLjj+gBUCfk
acKTg8cc2OtJ9ZSed6U3jUoiZVpMLcP3MUKtLeLg9r1mAfIDlB/wlbdmadXPmrsz
yidmbuZmOpB5voVQfiLYYy3iOx7YOqzXrl6udP07k0sV+UdSNRFxrfKeoQEFXgOa
Gdmnx4OG/e3p1fIKM0dPzZLoOAJF5m5O0xzXPL74zFCWp2f1ZkuE4A6l41koaZXC
N5XL7wWTLMLeNf9Byb5ksKqUuqEHAMd1nmoNMgjY9VfVfcrv9w43GG8FtpSX+TWz
B2zNS2OF+XIVnzRG5DeoULq8v88Z5bLpIJ/nx26r8A4SSwIBaVv4wPxAf1iPsIVK
arUCAwEAAaOBrzCBrDAMBgNVHRMBAf8EAjAAMBcGA1UdIAQQMA4wDAYKYIZIAWUD
AgEwATAeBgNVHREEFzAVgRNhbGljZUBzbWltZS5leGFtcGxlMBMGA1UdJQQMMAoG
CCsGAQUFBwMEMA4GA1UdDwEB/wQEAwIFIDAdBgNVHQ4EFgQUolNB1UQ8gCkVfAEj
8OeOr83zdw8wHwYDVR0jBBgwFoAUkTCOfAcXDKfxCShlNhpnHGh29FkwDQYJKoZI
hvcNAQENBQADggEBAIFJeKCcsTKcFqQMpTryujRGzJdYA+R9eBAuDLsatbtKtl4F
zkgRyOg31/+Cw7H8e30iLrPIFlWN1qjHrjgOyIs5AQ/hgxLvLir3hEUV2Z3MRsMt
jH2x9SG91PEM046gfPnc9gMGHjMTg1qvaKcLQP5UzpEYPLror2X4P5uXxaP0LIZR
zWmkw1RF7FOD7PfB5v94M5274XYxW2W4uKGd7QGnUZROSvSYkGiWDp1JhqXwfDz8
A0enITGXnoEkAFvvjiCqh64P1hIeMorj36pgL19oWZD6YrzSWHUz1F00juyuOfQs
qm6hvrDTqNpHNZ015fOURza1SkCvi9GFmNUPoVgwggPPMIICt6ADAgECAhM3QQV5
7XV/QqmiXDr0+GrOmqnXMA0GCSqGSIb3DQEBDQUAMFUxDTALBgNVBAoTBElFVEYx
ETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFNUFMgUlNBIENl
cnRpZmljYXRpb24gQXV0aG9yaXR5MCAXDTE5MTEyMDA2NTQxOFoYDzIwNTIwOTI3
MDY1NDE4WjA7MQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBXRzEXMBUG
A1UEAxMOQWxpY2UgTG92ZWxhY2UwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQC09InoWDgWPk2af0+StijSNOR8K/hN8D+l078oullsk4ASvSwjsCNo7sHU
a4xQUl5JO6VqY18LANwORjrc9BaX4MguzsbFXBe6uFh1mVpXmFxSpUByQ+950MFz
/evPgP96wV+z4TtAwW2Z34rTiz4DxMI07XYNFUEOls/gkUP2GxzymsO2kaYWTut3
```

```
SryCqeHEFbZFkB4urMk4xrIJC3CzWruS2Q0FHbBlfkgKN5wXVgkWFfiOucfCn+IQ
saqpo1d3f9jSkbtAV5w3vzfog8919MxKI9H6l4KuElnAtJ7BtZcsl7dUy9u9COgE
ykRiVokFQgqQ7XNDU+r3SeOWwks7AgMBAAGjga8wgawwDAYDVR0TAQH/BAIwADAX
BgNVHSAEEDAOMAwGCmCGSAFlAwIBMAEwHgYDVR0RBBcwFYETYWxpY2VAc21pbWUu
ZXhhbXBsZTATBgNVHSUEDDAKBggrBgEFBQcDBDAOBgNVHQ8BAf8EBAMCBsAwHQYD
VR0OBBYEFLv2zLItHQYSHJeuKWqQENMgZmZzMB8GA1UdIwQYMBaAFJEwjnwHFwyn
8QkoZTYaZxxodvRZMA0GCSqGSIb3DQEBDQUAA4IBAQBziaI2p86poGkjd/4KkkOH
G25nY/0eNARD6/oF0/sYonX2doizcGMk53riugAocCn5zbzhW/JVdYn30UxfyrZl
RAzEf7GHqgB/NyjOad3pdpVYeDh4ciNKjbs+aEoTWgAkoqENt1sRxlcvb7HVX524
bKZa1oPTUNlm6QpivtqDIdqGJdGf8L1zLfXBuo2zL3HR+M9CDr4Opq2JCkzP0Qhp
7poIccGE6I9Tsg+RrOA9iCQsPn1+Tg8YedjGzUWF07rNmT0TzPCVzUAuBlr+JJtz
OKypyQ3eoZ6EPazXqMyHAVcsm0GI364IOA0b8PSrJNtjh+AqJ5QfH+0e7NSzNnEm
MYICADCCAfwCAQEwbDBVMQ0wCwYDVQQKEwRJRVRGMREwDwYDVQQLEwhMQU1QUyBX
RzExMC8GA1UEAxMoU2FtcGxlIExBTVBTIFJTQSBDZXJ0aWZpY2F0aW9uIEF1dGhv
cml0eQITN0EFee11f0Kpolw69Phqzpqp1zALBglghkgBZQMEAgGgaTAYBgkqhkiG
9w0BCQMxCwYJKoZIhvcNAQcBMBwGCSqGSIb3DQEJBTEPFw0yMTAyMjAxNzA3MDJa
MC8GCSqGSIb3DQEJBDEiBCBpheScfJ+ESh8/z2r5jHx3Lw+5VkH8zTicO3HRGxfm
ozANBgkqhkiG9w0BAQEFAASCAQADy9VgxUcoI8DWKdyHqPM8nLuaHB1B/SONgbzi
4S1gIMs4wR6S02LpiG36z4/zFw0JUbvqwC2WJN7+W0Vra6ZX/x7Hfmv+uqdsMW6j
r8IXATRFWNm6GEbih2BsYABTNy8z0JGs+y6dcNNdDIwDJIkJETi+xv1eFA0deoWI
PyHmUjpzzjOcTAkFnSsa4lwSBOty8lZPW6u0klUx+VVGRkgg/0uXTBB1yGD02gbw
q5893RxO3g5zzxaYJP03zyO/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

MIIVLAYJKoZIhvcNAQcDoIIVHTCCFRkCAQAxggMQMIIBhAIBADBsMFUxDTALBgNV
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAFHb+aM8bhyJ1nFFuBDyyBVQf2Iplykrvv Yb
mKqBk08i2gecPSOMTkW5e2oQ4+WT4rtU4E0JXfMSA2KukKc+QUA3ycVCoL5zhetX
GsEx74S5P4JMY/uAoyBlEogGNi2lvagvgOGkqHJCZAjKjPNmqyTfafyv1Y4BQRQ+
WJi7mURDIbgrc0xfcC/yt7UWxFlfUhm6n7rTvRKhe4D0EOOB8yKupUgcDzBMTw5F
P9HEy0vFij12+LNKSsOPhVp0PbPkMCVi+ERtXEgV7C7BRVVYBiprpYJxJryO9t3E
jmIupqHZMgXxlAKFpBsdlPWfI1mrMVZTBpRgy8Bds7CORgWbs0MwggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAX1PxPDDlV2Wo766+MhR82lW8
pD0GWAM1ScYPggh4t5OFmSjFtyiqawhMcQhoRsAkGV387oXupYXH/lkaD7nIdZW+
pZK1/RZUU0txvlsRIpJduXcWm/Dsu0lQtQSfcg5FaslSMjBpMI41BD2KC9M5meDP
NqHnzNMFv0ZiPO6x+bTCXhds8WTi/B2DDyXGjEaN6RUFw6rKNXwbXoR0DJCMosF5
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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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```

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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X9B9kJOdsk/1en/Ln41PQoWCGshu23ftb7btgKzriCHzNQYFdq2Lr/1VMwScD56K
8RuUopGOJ3mwBDqJJweqYZj6h4NtdY1LcOy1+f0lObhLzcGQZ80vec6Uz02RNKCR
j816g+bUQuQSrJAecEnRy92vzQfnKngKknC3HC66S3kVQpf7ssyo/cS+hnj/VtML
3tq6Sw4fdd+mWlEKk9L4CisIFbV/P7Q+6HyreiOnai184ltgWA1AEKU47SIchIoe
gT5Gak9VyqGOhuyJVSfEuyphI7EUIjXFK6MMz35oWkwT5tcroUT4zYfH/p3W08Og
rQjBqIJfvVNTjbSXUfebiMrRNAPXSuN9knQkqHgNdh/0T6HsPGEFxvEFu38D+Qby
3WexSSUsUnH989T49sYCh6GSrk4h6hRl8Bhh7+UYg0alXi1SZzMMEMab7AGvuQI0
fKC/wXyhekq/1ZOtuEkDaTWvLedbHgaSKc/8WUItnLSefrR8iMgpTTQDsa0r+cEd
Zf1Nfv4eBMuSYAJ6fT5LmhDS5LlAbkz/1tBfYkkout37Uppu73u2tnx2lgtxHXaH
/4N94VfakQa5/J5s/yjx3YHb010Z1yEzgk3+GslWOdD5HY4PpX8oJCKEKChqr8E5
D/d4XnQqvVepA/WLTXnk8j9ZRTkpSThqo1/v379XqFn6IbQlQyg57EuhSWJzFlbr
92AByhfG3CgJcjhwGBp49vlu0axM9Ahx94N/J0H4HRECcagNDsIOhfufB4/8OyOc
BrK7Ai7RR8LDtknZ8oxMdg==
```

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
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAHMG7sjRDCJDMqgvQrFh4sk9MkaJJY7q6B3r
hY87n3jM6UYk/ZaBi9uzcB1pDAF0hJkFLmo+PRUbFLUrmeYfQI6OuvVElpwIDWMp
cMtfzlXgKAO6fh/On6aoVhpfv9EmaG1rCU5ezDPPbaXW8caNi2/yvL0ustpqKOTj
cOLgMK45tPcHeIaSD+8A4P0uf/GLzEFhDPdJrt3mVq76UbAoIGasA/sDhhg0xygq
ZH3IPQoYShFEUmsK+RC9Sc9dmXtVYPByCEsPdhTieJyjW695dde8xl7ZeWS+JZai
QK8pXZUdRL8El82+001HTXZYybfF05sFmJHQZ3LlftF2Dqs800cwggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEALvjSc3y8/+aA+Mk2+8tupO51
fsr8cR8BV0+aR/CYDXaeAFg6CPk12PnLcpFRZDdqitxfe7SpMgk0oT3IsBxvuOsr
0QckRlRLOwlv43Y9jJFMc7VInrB7bJ/cPHHgB07tPtB69/Qf252gsUs3UbWko8JU
JXBkymfUAe5+x8/gGQYNJdvNC+v9cmnwTORFF/IJ/WcGsyHPhxguR+JZqIJkSI8T
xjawV40qcahz5G/O3vLI8kxW96lSSmVE9WIuPafsMbP1KZN/6i1gaUOPFcsH1jln
fdnk3fToayCGwOAQvh/UYvlGTA06Rtnmz44YLZiGbVLFLGlvcXFfwL1JLdl25DCC
Ef4GCSqGSIb3DQEHATAdBglghkgBZQMEAQIEEJo6kOdMHnCo9aCxhG8k8qSAghHQ
oifxeGRuuDaxdcCkEyNhsAq0P92jEteuI38u48FqaDfBniUs9wmW/EiEaTmXWvdB
f7df3XeOK8yGqyR4pcXSYSK8iGfLezceiIwABbXRS8eLcNT9NPc5MPopD/h4q1Vq
+L1iuvm8P0OIh561cmKglrAmTebH1bnyjYLw6GH82/dscgRu4mihqvJTYQC3uaLY
H0dJnqyYV124/K0QyAPKCm3gR9gniHVlejlQKIVwOT649mTdZ6FVeMk9eaLQtKf3
mkx0trUzXduJnBj4cASKSovC8yySEuGwWu4kROF1g650ledfeU4SC9lwPwzvHPD/
lk4R/gUA0UAolIj7GaNDZ4CqpZqDYOG2wJvCQjfK7MU9TgoPsSRXhlmZPCam4ecK
gdybUd0A4UTQ9OlZiCrS0pDyKQyatn0u04SfKU/b97P9VwNageENErZTERoUx1T8
Vq9yBTKZIWoQe/2wsVvVJaR2+SXunrla9HDwpHqDtZHhR6i9TtnpO8KMOCWLZbb+
lVrxswrexUtGPCJRl62TBchhyO1dIyz8eWMiUvHhLUkFnSUGh81MdQKItc0qJ9g3
iu3tSd05AEHxNf+2hKrrTZzWCClatSvyfRbW6/OmlIzh9+JUyJLcCywJbxQUuWRA
5pc3bHrd6/Ff1dqgw1dbH9x0Q/r0lbKrWK98B+7/KIAfvy/XTW3NAJNdlzpzyhl4
Ko4ujuBiRJz0xRKIPSMOH4w76YejowDi4O5Ea/F44hlTop5N/lYNVkPIVnGYrEHD
7s05/cjQTX+A98PpoFVKHxphV+jRiwDz7uUYlW6ClyrC7/H7VkzdtPk07EyY+zXs
uThq5Js+uwgsbNqnA613vTEF0p8f8k5fLi+HSgL/TYz/UtW7JknTl6k7TvLXuQWT
UWmrWrD/UKADkkehGkZHpMZe+RaImwRd/x10M9+ZBovlbflDigfhRVimwTppKE2k
/S+GSXDs5r5ESN7OgIZv8swYTk6Nl8yoFijBD+wvWU4u6JNLl5RlJZZbki00Hhse
4Of2qogvmNfTpHbAU5DL4UWdehoK1fmPu4KaSpL2sRnTpqzyZEdAwG1JIOB0YAqE
ztszmcxi1s9KWQ/XdNJBG2QHvSMf4QTCuY2e+335Y9/ZC5WBphpAazRp9xfXc3de
Pl93N6ydfn09wT5k7TMeLOJrqPa84H06oRAyXqFYwiOVWRvyfrsInUv6AJfhRJBN
dA3ebIVCwrfG1w8OHerzDBo5yPc1ASLrmuPjaQ42CDrHqzfnMw9tHq5ZajoCGF60
4mzqu9/99upVaaToFRsA40lUpRN2QoOYUBOl3Ck34mWGWg8vf6akYADylm0SrpRO
yM+/8WeERonQcc3YqrmVjzM/yh4RLpl89oWWhHIHAAp1YyuwCj+kjiOq2HNhvyuq
```

```
9acwfjQ7mKBfK1i7PAydvWb9dt95VnY5LF+MvevJOdf1lEt6rISePs+AhoQCA1u1
B92MpDynfPUFoeRMx3do/zhVmY64qN7rlV0XxuuZXUW3WoopjdUzTmHycYBn7sM4
3U0d02yJgy+IqiTOusRaQGC3/IJiZmXoTL94wBsOB1++cP59GPyvm6qgM7iO9fUW
VO4ik8lTEs1WegTez1Lr96dwkPv6mfFJQIDlxVoZ4LVRf3FbQa9cZS7wxSe6hgpI
0Y6YB/s21v13GpCX8RtHEkEkW4Zc/9CrpUv+1/R3QXRvYOnQaWXc96w0/lVkoxCd
SRrlglhl6yY0QYvOmTbusUdC0QtrcQBRVcVeqqbfLhip9Nxe8vabPkoGQro+l5sO
xkO8YwlPt6oa0hh5NjqZaBpMhD0xAqHT0826xj7R5wp49KKtR90K4wuUy0OAWpFY
NdihvipP1jGuCio13PPc+Vah0+ACMMDvEWjYk2qEy2TRbWooNB9szzUoQ7P0kKJx
LfMSO7ecJ6sSsjcprsKzgOsjQXtIcAgRMnxFFaCfeg2zjW1I5HC+jbiNtqda0aQQ
L0RZ1a3KWIIPNBq18u+cXXjfaBy4HQhlXmQEnStkLrx1JuAI1wxhXWYdsrjJ2xEW
hQBjBwcnTAc5i/vU8H+oI1Pnc32DF8qfa51w1uLdoYl37PUMlerpXq+mPvL9cX/l
w2zd7Nc+UUezqOYPrBbwnrWOvG1msrjBPqKnJGHZJhlZOfLdmLa6inlsQBpX6kXb
K+8mpshqf472HOfje8/hrdLnOe9Qxdf8eNyi0DHs2MzxkYRktNJFIEK6JHo62NSG
/aM1VJbKudK1V7FFd/hrOAVg+uLbrsaFBdI6EE868qQpDThpd3WnyX8HztTkm7Up
zpPujeRarCgEk4RPLl3erYa7d+8lpD0hzZOlQkEALbSlCV0uTW3RSd60fNp4gvXu
GCzrJ/gsevjRJNggz3QojIXW9RFaU1Wwy80yIWdTguCswGBjMdUBRghKQlM6LlHU
qqXGdRL742XbYU76RVNlTnjUvAFvumey5cylAck7Lm68hV8rhTBsWMAJCP6VYhY9
i2AiW440gsNOWu/uCLBNpxPlfA5UFYNx3fo5XriyTPumhhkwsaF1N/jnWeXm8eUz
/ylnM5K6sD0gOX0ThLWVg90IC+qbMPNu5dOpCznI9DIup6dIhx8L2j+JoeqdsCBY
6Xt6KE8silLZAkYFFe5A57qlTq/z1s/p/6TlhmRP/2IC+2sSX9EBqXGDD98gy66h
rBapI4n5N6RNt1N5fnWJPVSnvFYIDQ145EmqPd/gUmMBF/AalgyLEdxc3xKOT+Gd
G0BcwQJdvmUp8rPGWgP5oy/qNIAdB3dnlfAdeOeeeiiGhaSpcwVhEaWOfYS+IXUM
kGWNDccjDIZHvGyLNYSihyAP6vOxZWzj2EWWUEAhtGodCQ74qm6JxRMGyVuBvyFD
MtZxMQE/AU/bPQmNBNCkN69NXyYW9Uk7p//Ef0EvZG4WYgQvaZ1u4E/P8xOL6au0
pDcB5UWRoqkyU7jguMb7f167iCgkRTTFSLULD+ljv/4zflFv4F6cQhv+NaEAF48l
fCUFjEMtGLCp99xxnu3M6CdiabZNCyuGEVkhzL/fq1JpVlgKRFeDFU/wfTe8D4QT
9tranwYyAVj3gd2f0ijrlQ5/9Ch0s83/X2CpSk8fHFOz3oBS7Gfyz45BugIhDqml
NkX8J2vKlCBOx2Xo/3waf/Wf3ajOEFXKR9fC+TSO6DrSS6XGBSQXn95SsWrzuA9I
RuemiW8+wYbygIW4auucs+V60BRwG0wxAzn+0lX7zac+WHjerZui+E/7ehmFc8NP
ZW/FVFtCYi6oc26dysKTzhpOUmh0WX4TvFHEx4KCL9QXTC/Ya1jrZTBFF+OtsJOi
oRDK2/yjrGU67Q1zK5escKJg0YdorZjMkfb0nNdjNOeJ1fLNL5eB8em/LEpaF+vK
aCWLa8tVvuq8ggUZ6PHQNkqeIssJoSXrmCfSP0DEtjk2ZDGsHaHOJ8KUBLR+wiSs
g+NRIG3Uvch6kARJqN3AgW1BySV42A+C6x+BPUEbcwDv3qz0DLmfNob4WArd+jyk
42Gnk9VL/bbddnhCyzYyHCr1D0XMIzewqzfR9ppDbgCLMxb7Q7a+8Umlkddd/aC5
wFUAVB88JT1gj+NqxHZs4BIStd91ElFslmx9yXD/dEUPGfqyl5tbTrbGQpfv393U
Q6L6cwZS11Rg+b7E777ZSuOWxJL92ATouJmzCYLjafI0jBN9BpGIymvi2QvUYgB9
9Bia2X/SRc1fc00VRK77c1GtW6Nj9L37eiXMKseQEWY3i94vY2Z61ytosB2BCcSO
R0QRJSWzXCXTJ6btCnFhZUuGhrnG6ibGKYmrTJTzNcrN4yJ/eByDqOc0YBUR10S2
uGMqxwB0adJ9ci+r76ZLzdo7OvTIb+WGbOP3IIYeSjIsymkc+ShbO4mAEcodrYX0
n3wYsjrhRYf4WIDxQhWJRUdBpty2LGl4OGUOTPOQPDaKwnGIiBUiT554NJMvv6WW
KLEBxtJlJQ8LhN/jo9ZwxwI/FZ68pd0h4r5Mh1atVxJHbLmnWmdd0L2b8w9UyBwM
ts/zY9bdjfndBgU3zmDsjkZgZdgGtzL9KbUwHDInvCKtODM+X7QQKHu482dRb/vo
uIkQDy6meuxdj8e/xzdSua2aSQhYaRXuZlE7uq4EyN3OcJB/rE3OR1sgKh5k+7hm
kSibtsFYYMWvBzh/Mata98kYHs6Bf+Rgx/FdA8989koFmkAb/B41NFKuTuS0DmK1
2SDKgHb6rmn+cftv1MOzfgJdnGObqa3NCEYnICWitPw6NAbqllvRWdKj2A91oMO9
YU1P/ZNox2vKWdH6rkpGfKJYVwdtVEwu1Nhaobu6p2c71RyCzJSYuAMshOyLXxgE
1mCup6EU6+IqLryA4WkD2IdpYbVP/tOdFLKY1fBcGJtSVdgJCXiC/krDLDKhrEkm
RCiIcf6ghGlEn0Jpk0xU3OWMh+kD01MO2IJuwk4TlT0kBRqZAtYWQQYQv0xecZ/K
DvOXZNUQQSzXFSpnGo7wOLoUh9gB5GOIbDqtAShYsCXbU3fuXl8/6Lojv+f0YBBN
```

```
capJh5oWBmJAmowJU3pL1JyABd5+R//cj1hQFApBKrs+cbP6ZO2cDabDWavBPPQ/
QQCPjbMENRsGrU5bdWRoG13qP8+FVk+aNHF0xtn+mc18scGhwfem6/hFgKyBCAZh
H7RmYuWoRZP73XPLYAM3sfwb1hLZSFNhbKHs0O/Fg2b5MkFy3DwttMbqH+2vDLBv
6CJ8s0VTULjSk9b+ddvk6rgUy+Nce4l3s8Gq1ZfUUdV/AfYeovwoUhCIkKYj2DFS
jBB6Zvoo8Z7zQpqNOHIiz+02zoYKtLconQWBGhVhn/A5ytYh05JZ72725AjitaE/
9iRvigf0u4hQrowNuR+5t6bjA+5nfpKimd/3G6JdvY+QcN3BizQ39ZyUrUr3pmY5
KkyHTZolsazk9ZKQY8LU1/nM2IraTuFzLhP6Mttj8DR+zXDjoPX5xxsr9VVWlcTG
Y1NPHo1SYvqScQ7K3LVVsiqAzbr7SHOABDF8ZtfwVqIDDmk7cubaTlUEdGA/tXTu
iQMYNv8iJ4MmE0tte0sRrPKKbnEPlf+UiSI2LDEYPuvXooGoroNFHzqPUX+6BswB
8GSEpsQDPzSJlYTugYrX+2PlM75c89dhfuidAHdubHMqurOUaWtTKTl57rd9en4e
HF0ZHQpXBgGQyQ7fT51WsXBZjxhWjHM4uDmc3WiST9DQX+blihwoOGx3moRbbAR4
UsUJ8lopNmbY+Pf5XGvp92PtxzIBJyJ1Wfp0nCX3g4LhuwHpi5JOGu2nfKD2LZR9
l9OehrIncV0oF5rcJWwKnRZbTBJgozaxKwkUUfp/qEAteGYxEeAJC0wy4ZD3N2cS
r3I2871gQAni/LsF8CEAPaXE6swdSsfc0GWTi5W+jnDh2oeAWeUOqb10+vwLikC+
Xm4VabpnHPZPiozLRL6TaVEqvmBpvUXgZffUIXpXHsWbVpJuPsIzMlmgeKEdwUvD
Efcmnds0p3V5B4ZaXLfR6aHdtrDT+B8eNb1bB2wOP/IA7Up4NzVf9BtEzq2JKj18
mtSbNmSuhSGqYP3fKWV4inAgRQiDDw3bnazMh/mI17qMLa25lzP9IJ5RNDRRWCjf
+mljnLpyYHb5RyZ4nqD4+w59YM9Q/v72C2cyL6WygYE4JVXIWdnrHPSTkjBBjoxD
P1WbthMP6DJcM5v9t8Rv8Mc8bPiUrKzMDCbXNcPJm1HDCnYrWXFYqOvUpKvWn6zt
Q39rPppCdrHkNzFS20MsvWiw9KsWg2rb/ph+qh418ac8VdyXNcETVgkLeYHnue61
Rbb04HvCvu3bBNjy8D6yRlFVIVxH3Zy7+iz3fJ70VwlqqpmlnMsidx3v1ykAeK1t
uo42n/3t82Dx/5s3p9rZnhWXUdO0etjL88GpyzvdwtkYy3Nj/8afvB62iUwZ1fR5
rcnklWkphSq9HL6brXQsS3lODDHsy8xIJlu5RrGD2MOIOy/rbMxNT5WnGoZ6j/RJ
Spn1f944h2LkyVFFNgIlq1W6MLfTNBrZZ6kMpJ8X39iL5KmkrQ1me1rgJTtM4heK
```

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
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAFeMxt6IIoOR5Kq2Jiucu85qezrNEQcYm6sV
Cuo2f+/3QCmr85ho7PNGXSmj0LkmkvIAh4RYf2fH6jqYSYgsxQjT3jOcx70hhTms
zQV8e/UJvWRvxQHhPbtnDFketPi2CA++Y8zqvbl3L/dBeL+ltiQqcQprqy9RY5pH
FibcQ5OkxPIzBZQUL5NrjwRf16gujq+nGVrhphjwjWsCX+ypt6ZrrBPtje3Iudw6
/0MkMj2lJPEkgWvFEFNL/FkcNRzHlH3dQxqjaf28Jp7eY/3tF4NVHcirE9DSc6hV
7v5zVlVEtthdFE9shnbPxf+Sbww+M3ZTVOxJwGNwPwhM7ehf8wMwggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAZ8MBsyH2Tp59sokhPP1DnTLh
iblpxffhKGR1N86t0QjQcmsND8MhB4aM7BtgsymR3IcdKrchClmkt6ATp9anhFwz
7U93WrdRIUcSqLnwoCU5P6lGpM+w6XYJqWjpU2Yd76iYLPOYBeAFtMbxdrOEwSCh
KZH2jyGohfZXtA8jwGbf3rV4sQ4EyZum5yfm0i8cOK7FPSPK/7pqtP797I9IBT0L
YdssDTrrNMDRBKZ8AXRO/UZFGyWAcX1SGSlwAQ4Ilg87lgUblYdKihC4VhH2Qn0m
YZG37Til6fmiZqAUFyJZp5nuJW8sUMzgrjzv8vuO5u66W7LoEhCQQYTRSrxFYTCC
Ed4GCSqGSIb3DQEHATAdBglghkgBZQMEAQIEEAfIC8XIvnLoAcDMT8ITOq+AghGw
lTqzvMWiOchU/VM97L/Ya1UcMR5Gp9ca4N2T5OXhTDXkanfsUHQtiKBHI9XXBP1h
Modt75Gunm5g+Jaj5K6hI2OtXZHGJFrH7MkZ6ttTNUeIHqtjacCA8j6Bunoa2qmT
MCCdHnTipVzH8tFx8d5xcNETtOvuUjXwIpBMsehYbKBqpEG3qcS/Ke9chuwIEbwJ
vDwkagqw97Cyn+b+EWAj2hEKUGnS/YtzsrhPwkhox3M+MG7eCJ577KUmIvrJcOZw
d7vku5E0Z075QiAfw40KaHVkqHsEEuAJ6FtQAOpwuHrTTZkMkTiZpETf40N4SPWu
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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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uIZgeibQy5/3hW5keuHgB1Q7134DgYMSSjj0C4PBvHnpSnuTjYPqgE6+D7UrNnbX
x6PbWeP0soJxQfy3i26+flQ2yPZcNIOSzSulQdK36RTeOR7C2XcQhsivgBbsM35Q
3E29rbMMFDfUzCZmdJNivvf+kvHID5I8RtX2p51YIQVcyItTunQkR9P/avTMBqyN
28vQlzFk3RtJrpOuy8m0nOfNue4VpUV35u3FdYIa6RkqLB8ZBiLcSFoi559B9czW
C6zz4GlpoHMNJbPN+dNbNFIoTeSi0dE0vHlP++Xo3phOC3bBcRxNwEoIExYwxxBS
uWGQBDNIdRHsYOVYSSiEx9QE0bOinnitTHLthPcpcE0yMQkl+diABJe/J5IBPee8
O9sicjpgeFcIozBDz26njPOgLMl5o0xtKDsJ1tKloM2g9NpA2kjXy/4uW1iru69E
c592xssBoY3eEzoKdAOE2OHUBVnmA2v+kJc51y1BkY3YYi9LICEDPZvR0PTDl72o
cJY2hGykCCDvfrTBjTuvIB5KeKgMfJRJDMtGAfzPESCXOZcDr4pXX4im1japeGUx
```

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
Boq0MA0GCSqGSIb3DQEBAQUABIIBABgRQRzXTRs0Jqxrl9ouqlyyOUVTZpzsEN4E
rRGV0bKlOV1O8OiF4s73Oamfc1GowC6YOss5JBen3EQq5NmMsFXjlU5sSiFGgsX6
IjkVSHC9c9QtdJtXyEoqEhf2lGJ22FcLjU0M21XxtKMlArch5aouJO1+nTj8AIqk
25JNvqG2dpiLaN61T9hSnyZe7bqDUflBo5Xm5REOc6EBvO+lFgjtIJB73QWiGBu9
C9iPJPz7du0yIReoX0wtkClqUzrBEiqO64SNQ2MuLTLrl2niNDfaQrvfDa62Y6Zz
RKPE+I461BxC2Evp18cJVdmOLPE/41b6QPu38l6L8/fSoKYoCk8wggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAbgflLBuq/SuTA535o03fl0T7
hFJz1cRgrOgdYfajI+bAIAncrUXPCxEhAIJAV9DNOJnISnnTNW0E5ND32Dbcji83
GwhT2iC+Uzx+0auUYuuVZ/go7eHMUWrY1Vm5dqNq5JbTwVgWy8lIC5CatZVYDVFW
o26J351tuF7mAaIaLYXOnUrLgqWpgqI7zXjHrL0hADXlaJARcCY3Uv/PO1YOsb83
1zQQs7Mu82fjhmJWqZ4yQX7rBKSk5V3aoPjFcj1w2vQWUXHqczJmr0ZHYiaZQuLT
gglkNNSPNFVlfipXESE0ksP3ZoM+DzLahjfKSLiQTY1Gacasb9+oVwALBhUoCTCC
Eq4GCSqGSIb3DQEHATAdBglghkgBZQMEAQIEEKODP8WCdJVi34OU9/jVCwaAghKA
Ed5TZquhpH35bEbuVz9wfPotJOKJ6xieYlQEcchc8+87Log3fBKWsZo1NwcRMZzW
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Z7LA4qbfbpw3708ps9KmKmlcrhmDs62DkZP26lKUgC98FmpmKgpKmPb/V475+OlZ
FLJkE8LVPrhBQlgJWSFmPCj5FTkWml+dAriVS+7RdkeohjOepRIw7ON+BODCpvSO
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hgANe0pnA87omyIXs3lWpkApS3Ri4HrlJXj8sM1gqJABeQEOOcej3yIlIcKgVh1J
OYPfeRlibKzDHbIpVFs5QMzKNNwil/t2+VmuV9Reye1pdtpXPFDP68ilPO/VCyMk
Uq6yKfU/3gtieCtCgYbh/5dAcYwAVwB4XvYqCO4Sxj369X90TBM5Ege/4e/jcNik
S4wJ1VNVIgs6WlQbAsQ0GwwyULguRbnmXuwXmLySLgKd3pqSeR6mM6HGGXe9rdSN
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ZP/IVgnm/tqkzVvYd0s1SmHdhQyXuGt9BaWjii2JZdrQjbUv7KrtfLcGUNGl3yzR
q4hyRecPQeCO89AryPZor5CQ2H1fi1ibSDcILtCP2UDzScA9qd3lvMRZV83rFcYl
```

cRYGUyckJP6aJFYUPCXRiDei9/nSkLDCIjtVHESDyUtGFTv8DeTH208INYj5xjBv
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ftDsbNZJoB7mTlMf75Ut4jax9YReArT22jhHyxZ5NiUu1200emE6VMlH2t3UB5gS
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yT4U/URV1HgDgeKAyOsAkTeSAZsK08cRvhxDrpLl7y5wOfxFkSbN/04KujYb6YBe
Z/aUF4VZeNeg7FEmpW6XAVSorFQ6DgMLmY2TyIIh5GswHwfcB7tqgYVYSieRM/ns
GZ9hks9nsg6NlaL5ueYYOyGs8MB50XHDS42uK18fvRI8qA5liX/CkCdUJC5Hlu4i
lt3BXM3Z25iaYaKEmosgNj4cMdreoKFckmq8nSBdeZdIJ0xWX4/ioBdOaQRTknIV
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U/qYmuh0TDeHHMO126VEPQXAQnxvtV/0MobXpswmuo91PVsbFgCU2IA0JDILkI/a

```
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r3HBtOIs6Y2CzkCH9nXfQvbv2LWEgsAgq4dLk3Z2NRCt/LZAWF3E5a1wW4YRRH7j
Ozl8aACWB6WnKnz82+1v2FciFB9L8b0gNwU01u7sE1ayC2TQGzXAhu0riMtqBiJX
bLmCos3/VelP2TodcI9HmrjSPH5HOWnP0h3M7VgXHbohm9FgOZf+0GNaSI4Hr/3X
nvFuT6JgJUS4Nrq9uE2RpZ1XDvLUVrwE77tnLaqXMbLeHm/V/TXviqaxEEgtCSba
iWgsWkhjk8JL/Oa/HBSA5mhf8Sq1ru46/sJXjRdZ1wXGEVmCoSkJmgKTn2a/8K1g
XE1NMeTFZucz8WJDAC5DFvqthrHHcAcG8YMVTE4EzwfTrYe9dxfHjILMDjP8A3Dx
c7tlM/6g1c4nQTI471xs28iOsRw3upKY1T4S5MRqidQD2yKYbBVp0zMAwsybq0ay
Bmugnz5xafztkADCg1mgQ4BzhXWz+0CMNj4txId3kMwGt7Qi20RDf7cDrv0S3krh
lDGwGSl3fr9aaLISh6m62v7hg5Jn4wl2yXEGxAPj2TXzZwVGL9hmzbghxt8pJM/u
HR2vMKohagn56K3xIfwi8QrWDBr9r8OKj2Ia88v2i/QeQe8CqOVu6yR8xAxGQFiW
mJZO3enMPl00rRF9wdj33CxaF2q2kVysid59tPfJanTHUYz+IFV6/NsRfMgye0gV
9k/ebq0x5OIIjAjhllfIFj/jyupnblUteAILhvNBfkqiDkWg9Yhqd2MZXgIGuJod
CLUq8fWt0iNV6WkSthZI4O2wMz3ek4YuIfyVrh+oxQcG6PihlwEu5wamZb2g0GDp
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aS5X3SZXYQ0hbG4KACkwKWTj84Jxflp+KMfdybhVz9HneTtiLMsvlibPVj54ZuPc
YNmELTHyCxjlsX61mmtydIAoitzN+YrB+MWx06KnPbWW18AsH/gWNX0qtYIRxJjY
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lwSllaTC9kNAplcvelROfuM5jqi1qDF6Q6w8pwem2m+vUc0aV0CBGJvvz8+Y76Bo
fho7SD9SeBOnCsSxq1cOKaeWPl10Y001wUfI061oTbSya/tbNGgaE+pXzIbhKCvv
wOTZ6t3+12dhZ0mx9Ozo1pxslASescGr4MDQePR6lecDPdgU6cJZMCzMiKrbZC1M
lFlApbM5HdkJOGOAVxHvbBP5u5SSfu5GGDcjiVp27A8kLGB1x1JkFr/ayVqyi0Zn
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zTgzG2iWGCaPHZvoCV0cv+Ln14a+rplNBoRDHhDuN5Vxnd8R3QFz7iL6WOW8XPUW
Vfhi1ZMHR8/e0rgqlF7nEw8B8XYydKsPRpYDnrjWOUA=
```

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
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UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBAGNl0aq5o2OJUxeEgaKipbTTomG9IBdUTU2t
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8uARKo/8CAcUANfGIjie+ojPw1o8eaDT8CQL8/T2TZ012rfdQahxsIAr83/tFQMD
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```

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```

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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

   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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8QHUBcwfEPe3kyK1VYRPwfwq4tpmLrfWtvofx/mZ33TAoMa3e1p9SXHI+Ndb+Sob
KL8Fyp43miL9wUFYKnv0Vo67do3cCXYOA6F/wbJw4V+oLdBS2amMQnMwpra94Scf
L+B1nmzQsGVpl5nieCQE935uFDxfxGUatNbKbsqkX1ZOIORPplfX+TJrAfShBsSj
E22uxGfq0Bj2W/3tdFVKnkxzCuNtKECq1xQSuTaWkAHW5apFfpVBpWxzGO5eoiE8
CadNkpr8YFGswCrirpoYqPgGHE68I96yIHal7H+ufo1XK7QH9ZtVSL7CEirYG0Xi
ZhGhDlQwMBDAhI/57sF2xfGgv8UEm7l7/94isN0XPkSqEmmbjcBpGhRBvRmWggnX
7DHoQj0viTY2Cj8B4f8ATvdCEuPY+JpCU3xWVdSTJSOXq9NH/isNzxWWxx2aCS2z
T/K9ol67FcXMJN8tH3TCs0VmXkYwID94DrPknaUXMPqr8fiTedByso764tCoK/bZ
FcDRnUbdpn8UCN8koJF4UMp6mHOwWxIg4ekX+V+REudBAWOXF9pRdury8xbVFb6A
t+RvY9aZhTTr7sFFDHOSlhOnRndzfOVj5u0iiKmdmk4NDMf/gIMq1kQ6m2/vjAEu
2H1p8DJ6XNsLCIZ4nwdqU5326tFOaeylTAcwSXox4M/23zzEHW20+DCSXn+GAd3v
U0iN+AKsss6pGPFxzwwBzaWBIpCdXmzV1w3JOoLiHQOx2IHkGXXEeaNPDBOa2PoY
G/vQRsJCv3vgeYHuq+oKiOORye1rLkFakmuSZjgG2Wo05B5tapxMHoW4plyNDDPJ
0cezb1xnqbDkceXcHa+nTeCouRCqd/P6YVz5ocD4BIdSwrda5GX+6U0bl/e+IDoP
pHWKijdsU3DAM+uCJrE9EwZHDrkW2qL/Spp9AhtbdMsugaIqVuuTQyCWhoK+wpz7
wjCdyk1XEMoCfQ8PAS1RyaSUz7fYAsIk9P+FZ6qwyvM9zhmvFQcNoj3E5ObIq18H
GezlvPOeoDwieqKamAHWkEwefrUb6X4IK9w8dBJrYQgCjnwPq9G0dWu+MbbP8xwE
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

MIIWnAYJKoZIhvcNAQcDoIIWjTCCFokCAQAxggMQMIIBhAIBADBsMFUxDTALBgNV
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBACGdltueYBykYh99Md439ZT6COO0DuOkUssi
mv3sONO23lQTEH4IDhS8pYhggW0VuZxgSL6feXXdBPYdr8UHnTNZm2X8X2fSpZ+N
HcdEN21H71tpKrFHxIznR1bEU7/Zb0maRg8+O7g5f1cZb/e0dnjEOLQsEplkUKik
wZQmfi0FJaFRTGEdQh29pQ7Ww5rVltn8jyZvr6IFqVPjOlhYJ3SciUdJxygMnF1N
FyIBlmNShELvkr8C4huv3q2LOr02QN/W8TdflPIDakY5zijst5q6ILX6L2EypcuC
LBTFWAyWYCsechbb0ZyZVFzg7+Yj/ELIeOg7ZC0iPjQhaB9lluYwggGEAgEAMGww
VTENMAsGA1UEChMESUVURjERMA8GA1UECxMITEFNUFMgV0cxMTAvBgNVBAMTKFNh
bXBsZSBMQU1QUyBSU0EgQ2VydGlmaWNhdGlvbiBBdXRob3JpdHkCEzB8R0APhiY6
HGLS64MvlsDXhpQwDQYJKoZIhvcNAQEBBQAEggEAAas3uwX/STpLX/lRqYFr8HSB
yVCdYgegxlTMbw98g/QmQgcNvrzFDvp6vF+VkGPOqTJAlFSQGJWraNLTmbBQ94i6
NXuQ3fDrGzr0Ll5RbvpB0VcqrejOrOojHrgkHKGl3DRTIH6tC4mgmOMYZToCev+H
bWpijRzWYdFH8wGQxwgfWKHF2AnXprLBxe6Uub+drp2fIrASfBehX3Aid+6gYP1h
tOy57CV4WIRA9/Xr1fAyxkfmChdQHHBziiuvplUtSVVQf5UoB9lKkjRbJhCe45IJ
mW2hG53SoHPyud6DIhDdUB0RzbTmnnSCnLNo03HohsszxDYJ3oa2Otu5UhvPxTCC
E24GCSqGSIb3DQEHATAdBglghkgBZQMEAQIEEN9CGuz4+n6t4epemVmxzYWAghNA
3D4c/K+3F1f4LD3bnX4C/QHDrrX+DwkHhmMT7SdnP5EfQngHFRFaLT14d39XpHOM
sD7kubDwB5uW026zEoxDmgfcYPzeY1OKVzr/sakxiMRWybdMQyEkwQYWxVzaSTLm
+pvssI56CmM/uImY6F/i8ncGRy2w+nuAjAhJFlXO9+NUzRPEweEoMccfZ8lX8yoo
Zy9e9LVvXQJ2gFyA9/Ny3NFXVlK7LbHIV3oAwztLE36nRBlrQRyUswvrYdowbS2u
fVPzhi83lINf02rA+HJ9WWLRgQtc6oGDHJqEzXiMRQMuBFWj/6sdhISaoELUCSRo
4ET9+D/hdrPpVuyUc7aglq9ihJnPV1Fod0ga0XHR9RziZgLqLknbroLOqj3mEFCd
y18HXQbUOCxNuIw7SoLfFfoN/qV7hGOfkf3eFrChKmvD4A+FYezswa7lFq37Zkzs
hL7EeLHf8PhTPmQmQVd3EFVWhIUrNvR2Fy/lZOJjvokFLpsAfMyh/gL+4SMxJkYr
MW5KtcDHH84o9J7ZYIZwhoc/Zr86uXtRVQN5cTJnPfMFsckBXD+KEWbTGuiXyzRJ
ZtzqfVywRm+4MTWmmRHq0CRuHsrbE1WCGmQ2zIjdUIOG2+cge8Uc2aAttFVXfnXs
SZ3K1JHmRkvDug4qdR62lDDg6zfJNnsStk8ej+y0fLKZJy1qs7/MxcIRjxFaoEvr
DdKbZk9Pk2pJutgsyU9p9bXN5qZdQWJSM6iZL0VVeolN0sZC1A61eeJUAzbytV5T
2ahvUGLR/zNMLSFyDUj4/et0/wuwqPVaLLT6VqrG1gylt9VAUm6nfDTj1n5mIerB
tVobrisydTBQ3wwDKY8s9t4kebInwfJx5l/lFaDg+BfMmZfIxph+CEVdaWE+ORgD
97FgoyL7j60qzJvInsEUe8Bb5cml8fyMMYGMlydDGHVUZUGI6OxFaJZMpAhuq37A
7z0/Y46ykepVvOzjZCBhNldwsW1AftSoWSEXHGbOmeI4rKELBiXqZ2TidS3Ny5Y5
WGRzzUYufn5rD4OULPIPbi25Fo7WydCFnOIHBSPaZNixaM4fcjSqCZcpXnuzKOGG
M6iGJ8F4rS3oFgXoeHDSM0CWnLS132zD/NKRklmLTiAgwEJ9BPG+NgNIIouZkv45
EbFiYCGef4vBisukj0yDBvhlzTdrGAeHk2nqIF5B9DFc3GtuzKUjY/5xLQ9GIWuF
NFgu6DoHqVmoBaISDRKFlYr4vxqWsoW6a9+yIOcTqLL6ll9hu4Oc0SaYpPEZLV95
io9pBC4N9HPS8tVBzd/GAeK/BUiv1zordIx9GgwB/200pNkUyAuQ+DXL4yv/MROX
Dp2tM0TvUNIQNpbcLSP3oGkEll1d2IvTFsKJMXBkCe/oASFUQDD0C4Upv7B6usoJ
```

```
ZH5t1ne3dnxDQfBvhykXpWMxFEkktxpW5EwY5Cl7Br9f10LDX8wntj41F7ddxzDE
xwk0GOkYfY7JTVnxefTyMCN8rYjEiQCa/KEgeZ2y9ORPG7tnDWpmSbRVOxPrmFDp
sIHsnefohCbNuoLfWbcHsGX2nNQd7zSn4GRQWAUV2CP10/sVcsthEjTKsHrhMaVs
PoBrhEos6wS2PBa4zLsFKTe85ORkowEW+n7TGU64Nz+TNR8w2xJqZrhJEiMvS51r
uQ4fg1vijfgwPlmufZfH9UcTzZ4EpeRvTQp/Yrfc1uIfIliJSIqf2Vk3VJ1trJxj
Jn0N5EDb/k3bNdxsD5GfuYgaO4bBtQ+8inywlbC7BXtpRJaEdE4xbPvQ/xARTV1r
SwTwK9cMhzB86GM8KUqLtNhvMOJLitfVRLlRcMYXYcpKaaBvXkPUtKDFU7adHC57
OOz8WCgazSrM29c8IIvKJKtxk0+zSZ5riscOhNXR7wuWPT1ZMMXWir0oKJIRO/Y1
XptrfKa8goaSOE6abQZHMjdUwehU2W5epgZAz5XIUS0yBXpqv6f+NRpB75zazfNU
39buyaJnytIABH4r6777ft3oLe/JI0Eeput70P+imSENLRulQnafte7ZaGMSAsQF
v3RnekZqnYQnUSPU7hK7vn+sXbkf5tI6ntF7/XXY/BMrk7bAk2dvjiekscZy0Jsf
CFKjpI9Y+dJ91+CXBGduBmavKSZ7xGdYayVKLyQ1SnGNw+IGm0sJ1fR9AzxGI3pa
XPh55uuzGOFY5Y34kCO/+0KLbJ0ry7UQGGm8F3L1yLtKeFvYBj1pyAftb7VdMI3D
XlurTQ+03tPrWP21wFPpB9nZp7i+8JaH5gJSec0w9uooEXEZHkhoDzE/wK51uJgC
wuPcTFMrXNI2nGaiNJW20FDTsOFZ0iit3cx54qT6w++P6iQRJOzAH2ncSkGz4DFC
mHlYqgrY69jGWDa8Trg0RDBQH1aUAmOAlhmyVLumqBdpfQN7mppB97DNNVRsDhSY
VnnhvJH1YVzGJ1vxE50CLTfz8vDHgQmjLfab9IdJ2hb9McpWGGqLLw/u+363yxsv
ijn5Raylovp5o7XF9t+NKpeGPNXamhbc22Yg08omXRsTv9RicnuPUK6WX9TGp6q6
9l6X/8rUNdDGKxwCfzVK2pknexty1h1rjMY7QQX5QD/MEZl2BHdVtjN2+DvoqqTZ
N8T9ow7vZVKgTM0TWy9of78D8KLMW8mHsq6nHD9X97ROrkucD8avlQdjgTuHbQH2
wXg1dxGGPQR+xDF4p40nfDvILWlEGndaYQH7qBJYvwE6uxO/6uk8otg8AzdfxRlK
60DByDHk0N8JDQmek0bEHSy4CbuBZgDDZwQlAG7ade0WSRUZ0ZwHGPfFEozYNFG8
fCluzUuOOaPYUhDchIFYVOw30TwtoDwkEbcMzXXqBpXMzHD4Yk1TIKZY/ok9M3oa
Oei8xx3pPFJaxfSodmV/qXwv5b+f/UrmCwwC9gLIljzg26o2KZK9SGQfAMf5HbqN
yzp/RyMKr88w6urhdFdXI7UvPAcsi4wOOA4Q3ANX0T5E/3M9oGRyKpUridBt0Pfe
Bmyr2Cq6yWDVs94OvPm6b1hOsOTx2KUTKKMTxWbbKjLKob7C6srYllc4x9AzjbJX
XJu34KZxfbuRbL5mLzpu5BPXQE7VIZqwPXoYl+uvj4sAGq8RfHqpbeExVZAuGl+y
Tb0gGtwaIyb3xTMV86tkjzMFprxMgbj+iHAeU0k2wbF09Cq2wXGddBUEH2XZYCgv
aviaalJRhNKIhvr0zmvugsjnsFlX91MYJwGJbw2TbSxLLcKK6Buan3e83SNVZGPi
Tvvsyo4XebbkCxMy4Vnd+SYRfdPx2wfleJsq6LYqSrAA0DgvTjs/3hnVtGL1YQcd
jttlij0V8i0VicD5bNUbB132G5qy2BoflCkwdjINBZcx56fXKMOJU5cAf+XGD68p
shyNm+/cexdiiRjNGChN26m/yNiPAkCwrPacnj+Z/2DTvmFFutAtImSD5y30NOyH
YtxtuufCXPtwg1wzXcetvufyOHCquSLWIhB/usDLS8L/eqBJaezmF7dHa9oWLz22
SjiGi+R/WqiSSFgBHAznUd7Wm9cUitJxLpMzVJDeotOGcFyVI0nXUR43B54+phJu
B5UBU5DSt8VbjehmLUa4VCw8q38vDbH7L4NkTd3pw38lNrNuzmRyIxcq6Ta/zUmn
CbWBfA6WoBHdaq+Lp8q3VNBE4IkVJObiYWtAegODFUIlvASixnUIYl3YePRXX8+5
QTGxKzosyzYBm2Xy9cA3DrEY7VviOjXzAtNozQRbiQY0dcmDpc1GocJPk7gNFtPO
BeCwMhlJ3+UVg+vMeX5lbAK3/gnMCSryxSgs9ku5v4ltN95KZxfOTmEXg2r1SdDz
pvwkAXzp0wTyD1v12fAexu5KpFTSqauxy0tR682iWElbxmPmqnxrU3Gii0Tass43
KUtV7fRY6Lw9DO/hcY4HCbL0uCeCi0YTsM52GPBNPyJkVzQjBAlATxmgSrW05+ND
Ww3FoDL2ae81XWH4n3ZAZmRwTt3myeUm2UyBWDrXsQOb3MfENTrQDjoI4KjoHHyl
k0BOS7MfR2SmSJh24aBsZgGuTekTVhcqzJHn68b2H5VkIaiSTS8LNBa12L37LpOK
7jugg1RMU3KHdgSS4ZrfreHn6R3Mjz380TRwms+6fs4d55mqLWtnE6KMzm79cSw8
flCcTKgYwpJdPX8qZR6BJKbR9kTeOdWcTgeJtoeWHMccVd7SLFa8Ya7MFAufnkX/
nKyGteImetM81f2OuOc9s8tdvH6MnRBCGs6TLBJ/6HR7gvkAO8mm7Q7hF8T1f1hW
7SBcWyV0ombMqutB+VxvKpzWhg+dozChhIVijh4uHCEhgHrDKgCRvQ0xdvPTce/f
boPaajtf28SlJtoc+72AISoXv1QhQdInO5K36T0MhC47PTZMEVSYwkd+PluzO1ue
jVw9f4GfO9lmJ8Ly5VHT9auu/wLiJ7N1x1Fuyje1+hBU+eH6vtf/IPDZsYNTyo+7
r9hjMHdLYoDBqRplLxkEiOhD3j3VvJdTF0D84Ke97ICldKmdtpgTMeXgFI21OolZ
```

```
dZWUeBo2xeqqgJWyNK0XykgOi6uLjs3pW72taG3q7pIgn66rHdQD5rixjisP2uTM
yDznF+q5QbrtSAsQ3YoghwqLnxQnWrOp0swcef95tLHcJu6k3NNXiaMVVAZlWBIh
UJ/Hw679GGoXXVFveIzLA1gcThjJ7Y7IU7ipbx8JpczGUXkLjtEuOYxlBBm51q0d
F39q5YeNs0Z8DXg/Lo8xFgGKTzAuzDfmyM/vabHxFHTUJgyB/Dt/MrAGLztwvBjB
sffTcVoAnzv5Fv2er9Qxgl7psksLwfRkV59IclGPrxfgwdZM21b0A3FURCGWvTMe
QLUm9pmb7HsvBfzixhvWU4Wo/OAtFWX59lSAlSeaNaRqtPNAiyj5mdnvJ7Ujl1FG
h+GAhGNn5yL27v9gvgkzBdUlq37eiNjjzu/m4YBZEkICz3buOVO2/io+vy1rxud5
aMed7LnIqkXn8qXz2KPouU9BTiHwXLPby4FzKF6vJVF6q870R6b0WEYu0uRwTjLg
y2dHTpVSjU9rhTu4fHMbvgDBgvRKlY2GWf/d8DSb71lSgWVZvq6SYtjxJigqNKYq
ekAKOGbchPbn0SRnlYkCCUzOzVI0nFs7SogYWbNv7lI1IkE5xW93Anpytzo6H7iQ
wX+1hB1jm/Q5iiBYTJU364NCqJ+a2H93H41Bf7PSMhoW+RvSoO7JUAsaOahQPjP8
c1NAGqPTShgHDWE/1PUHRZ2+AjUOBY9tIe+NH/EF0zPY7uMXhm4srokBSdn1rosB
6NAnIxY9DDK5LiLrkpQXJJ3Dciifm7ivE+/FRK/4gb4RRwmjxTUtNv2c9Q3apdwX
ZawER8MGwniMghNwU0plAdt5z+4aZ0nU6fW0S1eAsTZ1uR40BTf911sj2llFdEoL
2ZeUBYWm+lmx3MGtJIvYk93CmlJMBY8Mlcd1h/vT1FooJjt8EjjLBjzJhWacTbBO
9/F7XjLzyEaG3v5u7C5T/mdDhYYyoQQj//M34pIUuGb8EL4Heq2wKX/k14QG7RBy
PtKY8+Uso6DUFztfHwwyjafJKIcddFxiO/eQiIx813Uj/q5BGRRufrNcSVFAgDLE
zTvGsoZGWkr7zxUw/cfoRAlzKa2h69SCFk4XcYkLLnQVEn27NXN3FhxQDH41f6qt
CpVIpqeJl300v5fDks3ne84iKGQkMnjdYRGJ2UzGvaxGA9NN28zdhPZKO3IqT3dC
2Nsq4TgBk/0wICjSg/vlMjaYVifBZo4H2Swb4CSbYh49S6upMHU+Kwx5R+x9TBNG
vKK14gPzebpQxtjeX/oIJE9WEUS9/STuHpVRnuhYl5kbnD6XTOs2crZHpQlCNm75
z4gqzHsG/ZXD//NkxsFPb6y7A0tmhol7wiEbLZf7r2O45YE/UGR5IcTcQ+q7dAu+
T6VXouyzcU927dN6PiKmVkd5E6+oR9zcMWopXvsR0cLR02+SzbtxIeQofq7TV4Gf
ZaU+lNTzOusfGZR8erXiptDVThvRbk+SpjCydJUf6RKpmQ1TVod8tIEKH9JpBftn
lhmZ6VHKEM939lifc2pDl9TkyX3I0QBoL01MuPRbpDJiDODIdZmbNltgmoE88maY
nZW3ZG6GhUjQsYSGEtuyZ6CkbC+dlGIWaVYQJM/YycxZ5QxasmgHwQ9jEgoMfXiS
EfIBev7/ciyPU76nT/ZcExZ5OYaX9NHvNpL0KJzTNi7NXGK/JDI9gb6P1DTdwreH
6FdwlkZe4ZX6TpCDrXl1FdL5bI6afUIZOpiiUZtICwVFTzYlhAlui0aD/79t0R0V
EjXZ0G3JdJmqdd50fqxVfcq/xwDOqqbJUvcVcWg2F6zAMfdwQFNGx1qpL2etFspL
vwe1mTu1UUP2gUBXpQyPrmf4EM768VaLjRoAFu2v4/M8zalr3WOtokr9YfiFRPEH
EYAdFENn6A7DDE9uhFPJ+qasySYc1NwmdGtXVS5ynJw4GERicu7mJAa/L5fVzd6n
xDKBsoZSv0yR+1I5Nl+79Q7L5xE10bITWIL00J8pxTE=
```

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

MIIbTAYJKoZIhvcNAQcDoIIbPTCCGzkCAQAxggMQMIIBhAIBADBsMFUxDTALBgNV
BAoTBElFVEYxETAPBgNVBAsTCExBTVBTIFdHMTEwLwYDVQQDEyhTYW1wbGUgTEFN
UFMgUlNBIENlcnRpZmljYXRpb24gQXV0aG9yaXR5AhMPLSW9ETmXSs5CVIeh7j00
Boq0MA0GCSqGSIb3DQEBAQUABIIBABfhanpcfRrENuk7s3Y/t208MLeCOtKAgVuq
+YxkFGf1eaxIShygOHSwbXnGM+P3BCMmQ+iTm3smLm5KvZdO1e9Mle4QERyC2//p
VNSbK6NWD+5sFc9YMZ9BrQDIkQ3gSDtVpZiCoNUh/IFYw0d0Bu55kTxrD1iIbPdx
rPSwuyLw43V+ytTi+PpnlxvI7mGYNLZxHkFIaY1zqjpqdMphNko5TZBE2tXZP37+
MQ6slzZZ4nnUDIPO9u85PlEabQM4zbTd3gpdri8wZnNb16kqnoMR5/uv8JmAgvEw
hYY1akgApGMqM9G7wjVSd3vk2kXPR8iPUP7dszHXdlbog0G7hlEwggGEAgEAMGww
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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:

```
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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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:

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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.

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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```

```
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```

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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:

```
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.

You may also be interested in the latest editor's copy.

While minor editorial suggestions and nit-picks can be made as merge requests, please direct all substantive discussion to the LAMPS mailing list at 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

-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 is 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.]]

- 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

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