# BPC XHE Profile Version 1.0

January 4, 2022

Business Payments Coalition

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# 1 Version History

| Revision Date | Version | Change Description | Editor Name |
|---|---|---|---|
| 11/22/2021 | 0.9 | Initial import into template | Britta Holland |
| 01/04/2022 | 1.0 | Incorporated IOC feedback | Britta Holland |
| | | | |

# 2 Introduction

## 2.1 Scope

This specification is a profile of the Exchange Header Envelope (XHE) Version 1.0 standard developed jointly by the UN/CEFACT and OASIS, as published here: https://docs.oasis-open.org/bdxr/xhe/v1.0/xhe-v1.0-oasis.html.

The XHE is a digital envelope with standardized header information for relaying business documents between Access Points (Corners 2 and 3), as well as optional end-to-end security and integrity between business users (Corners 1 and 4). All business documents exchanged between Access Points in the BPC network MUST be enclosed in an XHE envelope. All XHE envelope instances send over the BPC network MUST conform to this specification.

## 2.2 Conformance

The keywords 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL', 'SHALL NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED', 'MAY', and 'OPTIONAL' in this specification are to be interpreted as described in RFC2119 and RFC 8174 when, and only when, they appear in all capitals, as shown here.

## 2.3 Terms and Definitions

For the purpose of this specification, all terms shall have the definitions defined in section 2.3 of the E-invoice Exchange Framework – Approach to Managing a Federated Registry Services Model in a Four-Corner Network report found here: e-Invoice Exchange Framework: Approach to Managing a Federated Registry Services Model in a Four-Corner

## 2.4 Disclaimers and Copyright

Views expressed here are not necessarily those of, and should not be attributed to, any particular BPC participant or organization. They are not intended to provide business or legal advice, nor are they intended to promote or advocate a specific action, payment strategy, or product. Readers should consult with their own business and legal advisors.

## 2.5 General Use

### 2.5.1 Referencing this profile

The following identifier MUST be used when referencing this business document envelope profile:

`bpc-envelope-1.0`

And when referencing the data model using the QName/Subtype Identifier scheme:

http://docs.oasis-open.org/bdxr/ns/XHE/1/ExchangeHeaderEnvelope::XHE##bpc-envelope-1.0

All implementations and uses of business document envelopes in the BPC network using the above identifiers MUST be conformant with this specification.

### 2.5.2 Mandatory use

As a network policy, all business documents and other content exchanged over the BPC network MUST be sent within a business document envelope.

### 2.5.3 Envelope technology

The technology used for business document envelopes in the BPC network is the Exchange Header Envelope (XHE) Version 1.0 OASIS Standard and XML syntax expression using the OASIS semantic identifiers as published here: https://docs.oasis-open.org/bdxr/xhe/v1.0/os/xhe-v1.0-os-oasis.html.

All business document envelopes sent through the BPC network MUST also conform to all conformance clauses in the above specification.

### 2.5.4 Encoding

Business document envelopes in the BPC network MUST be UTF-8 encoded.

# 3 Payloads

## 3.1 General

An envelope MUST contain at least one business document.

The payload with ID = 1 in an envelope MUST be the principal business document of the transaction.

The envelope MAY contain additional payloads related to the principal business document as specified in section 3.3.

A Payload element of an envelope MUST contain either a PayloadContent child element or a PayloadExternalReference child element, i.e., it MUST NOT have both and it MUST NOT have neither. The semantic requirements of a business document MAY disallow the use of externally referenced resources.

The Payload element with ID = 1 in the envelope, i.e., the principal business document MUST contain a PayloadContent element. In other words, the principal business document of the transaction MUST be conveyed within the envelope and MUST NOT be an externally referenced resource.

## 3.2 Batch sending

This XHE profile does not support batch sending. A business document envelope MUST contain exactly one principal business document transaction, i.e., the envelope MUST NOT be used for batch sending multiple business document transactions within a single envelope. Any business requirement including batch sending must be specified in a different XHE profile.

## 3.3 Attaching associated documents and artefacts

A business document envelope MAY contain additional payloads related to the principal business document. For example, an envelope containing a UBL Invoice may also contain a PDF rendering or other visual presentation of the invoice to assist the recipient, and it may contain supporting documentation related to the content of the invoice.

Unless explicitly specified in the business document profile or specification, the validation of additional payloads is NOT REQUIRED and a receiver MUST NOT reject a document based on the processing of additional payloads. The sender of the envelope MUST NOT assume that the recipient has the required capabilities to process additional payload(s).

To avoid ambiguity, the first occurring Payload element within the envelope MUST contain the principal business document of the transaction.

# 4 Data model

An implementer of this profile MUST implement all elements specified in the table below. Implementers MAY implement additional XHE elements, however they MUST NOT require that a recipient be capable of understanding them.

| Element or attribute | Cardinality | Definition and use |
|---|---|---|
| XHE | 1..1 | Root element of the envelope. |
| └ XHEVersionID | 1..1 | The version of the XHE specification in use. This value MUST be set to:<br>`1.0` |
| └ CustomizationID | 1..1 | A reference to this data model, formatted according to the QName/Subtype Identifier scheme. This value MUST be set to:<br>`http://docs.oasis-open.org/bdxr/ns/XHE/1/ExchangeHeaderEnvelope::XHE##bpc-envelope-1.0` |
| └ CustomizationID/@schemeID | 1..1 | Identifies the Customization ID as of type QName/Subtype Identifier scheme. This value MUST be set to:<br>`bdx-docid-qns` |
| └ ProfileID | 1..1 | A reference to this specification. This value MUST be set to:<br>`bpc-envelope-1.0`<br>as defined in section 2.5.1. |
| └ Header | 1..1 | |
| └ └ ID | 1..1 | The identifier of the envelope instance. The combination of the Header/ID and Header/FromParty MUST be unique, i.e., there MUST NOT exist two envelope instances with the same Header/ID from the same sender. |

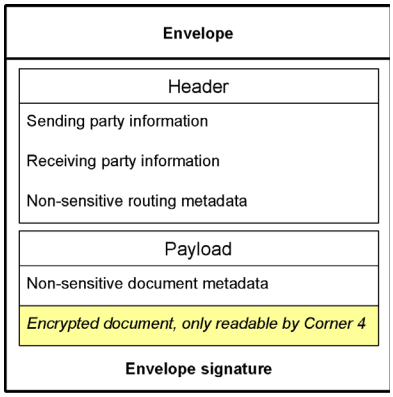
| | | |
|---|---|---|
| └└CreationDateTime | 1..1 | The date and time the envelope instance was created. |
| └└FromParty | 1..1 | The party sending the envelope. |
| └└└PartyIdentification | 1..1 | |
| └└└└ID | 1..1 | The party identifier of the sender. MUST be in the format specified in the BPC Identifier Policy specification. |
| └└└└ID/@schemeID | 1..1 | Identifies the scheme used for the party identification as specified in the BPC Identifier Policy specification. |
| └└ToParty | 1..n | The intended final recipient(s) of the envelope |
| └└└PartyIdentification | 1..1 | |
| └└└└ID | 1..1 | The party identifier of the intended final recipient. MUST be in the format specified in the BPC Identifier Policy specification. |
| └└└└ID/@schemeID | 1..1 | Identifies the scheme used for the party identification as specified in the BPC Identifier Policy specification. |
| └Payloads | 1..1 | |
| └└Payload | 1..n | An envelope payload |
| └└└ID | 1..1 | The identifier of the payload within the envelope. The Payload ID MUST be set to the ordinal position of the payload, i.e., Payload IDs MUST be numbered sequentially starting with the number 1. |
| └└└Description | 0..1 | An OPTIONAL human readable description of the payload. |
| └└└ContentTypeCode | 1..1 | The MIME Type of the payload content. For XML payload content the ContentTypeCode MUST be set to:<br>`application/xml`<br>For all other payload content types, the ContentTypeCode MUST be set to an IANA registered MIME Type. |
| └└└ ContentTypeCode/@listID | 0..1 | An OPTIONAL attribute specifying that the ContentTypeCode value is a MIME Type. When set, this attribute MUST be set to:<br>`MIME` |
| └└└CustomizationID | 0..1 | If defined in the business document profile or specification of the payload, this MUST be set to the Customization ID as specified. Otherwise, MUST NOT be used. |
| └└└ CustomizationID/@schemeID | 0..1 | The identifier of the scheme used for the customization ID if one is defined. |
| └└└ProfileID | 0..1 | If defined in the business document profile or specification of the payload, this MUST be set to the Profile ID as specified. Otherwise, MUST NOT be used. |
| └└└ProfileID/@schemeID | 0..1 | The identifier of the scheme used for the profile ID if one is defined. |
| └└└ InstanceEncryptionIndicator | 1..1 | When the payload content is encrypted, this value MUST be set to:<br>`true`<br>Otherwise, when the payload content is not encoded, this value MUST be set to:<br>`false` |
| └└└ InstanceEncryptionMethod | 0..1 | The method or algorithm used for encrypting payload content. When encryption is used, payloads MUST be encrypted using one of the supported encryption methods and algorithms as specified in section 5.3 and the value of this element MUST be set to the corresponding identifier. |
| └└└InstanceHashValue | 0..0 | The InstanceHashValue MUST NOT be included in the envelope. |

| | | |
|---|---|---|
| └ └ └ PayloadContent | 0..1 | Contains the payload content when conveyed within the envelope (see also section 3.1).<br>When the payload content is XML then 1) it MUST have exactly one apex element in the XML element tree, 2) the XML MUST be UTF-8 encoded, and 3) inclusion of the XML in the envelope MUST NOT cause the envelope to fail schema validation.<br>When the payload contains entirely textual information, the content MUST be encoded according to XML text encoding rules, such as the escaping of special markup characters.<br>When the payload contains binary information, the payload content MUST be Base64 encoded. |
| └ └ └ PayloadExternalReference | 0..1 | Contains a reference to the payload when the payload is located at an external location and not conveyed within the envelope (see also section 3.1). |
| └ └ └ └ ID | 1..1 | The absolute URL of the external payload. |

# 5 Encryption

## 5.1 General

The XHE specification used in the BPC network supports encrypting one or more payloads of an envelope. The separation of header and payload information in the envelope facilitates Access Points to process and route envelopes without knowledge of their content. Encrypting one or more payloads of an envelope allows Senders and Receivers (Corners 1 and 4) to maintain the confidentiality of sensitive information while still allowing Access Point services to route the message, as illustrated here:




An entity registered to receive documents through the BPC network (Corner 4) MAY choose to support receiving envelopes with encrypted payloads. Likewise, an entity sending documents through the BPC network (Corner 1) MAY choose to support payload encryption when sending envelopes.

A Corner 1 MUST NOT send encrypted envelope payloads unless the Corner 4 has made a public certificate available for encryption purposes as specified in section 5.2.2.

A Corner 4 entity MUST NOT obligate its senders to encrypt envelope payloads unless such requirement is explicitly stated in the business process profile or specification.

## 5.2 Digital Certificates

### 5.2.1 Allowed certificates

The certificates used for encrypting payloads MUST be valid for use in the BPC network in accordance with the BPC Certificate Policy and MUST be issued to the final recipient (Corner 4).

### 5.2.2 Use of SMP

Envelope payload encryption in the BPC is accomplished through a combination of symmetric and asymmetric encryption, using a randomly generated symmetric key: Corner 1 encrypts the envelope payload(s) using a randomly generated symmetric key. The symmetric key is encrypted using Corner 4's public key and passed to Corner 4 within the envelope, Corner 4 unencrypts the symmetric key using their own private key, and then unencrypts the payload(s) using the unencrypted symmetric key. To facilitate this, Corner 4 needs to make its public key available to Corner 1. This is done by adding the public key to the SMP ServiceMetadata record of the business document being transacted.

To receive envelopes with encrypted payloads, Corner 4 MUST publish a public key certificate to all endpoint elements of the SMP ServiceMetadata record through which they accept payload encryption as specified in section 5.2.3. The public key certificate MUST be valid in accordance with section 5.2.1, and MUST set its TypeCode value to:

bpc-envelope-1.0#encryption

By making their public key certificate available for a given endpoint of a given business document type, Corner 4 signals that senders MAY encrypt payloads when sending exactly this business document type through exactly this endpoint.

Corner 1 MUST use the public key certificate published by Corner 4 as specified above when encrypting payloads and MUST verify that the certificate is valid as specified in section 5.2.1. Corner 1 MUST NOT send encrypted payloads to Corner 4 unless a valid certificate with a TypeCode as specified above is published in Corner 4's SMP record for the given endpoint and business document type.

### 5.2.3 SMP data model for publishing the certificate

The following table only shows the additional data to be added to Corner 4's SMP ServiceMetadata record when publishing a public key certificate for payload encryption. For the SMP data model in general, please refer to the BPC SMP Profile specification.

| Element or attribute | Cardinality | Definition and use |
|---|---|---|
| *ServiceMetadata* | | |
| └ *ProcessMetadata* | | |
| └ └ *Endpoint* | | |
| └ └ └ **Certificate** | | The SMP record MUST contain exactly one Certificate element *in addition* to any other Certificate elements required for the given endpoint, such as to any certificate(s) necessary for the transport protocol. |
| └ └ └ └ **TypeCode** | 1..1 | The Certificate MUST contain a TypeCode element with its value set to exactly:<br>`bpc-envelope-1.0#encryption` |

| | | |
|---|---|---|
| └ └ └ └ **Description** | 0..1 | An OPTIONAL description of the certificate |
| └ └ └ └ **ContentBinaryObject** | 1..1 | The complete base64 portion (i.e., not including the PEM header or footer) of the PEM formatted X.509 public key certificate. |
| └ └ └ └ **ContentBinaryObject/@mimeCode** | 1..1 | An attribute specifying the MIME code of the data contained in the ContentBinaryObject. This value MUST be set to exactly:<br>`application/base64` |

## 5.3 Supported algorithms

### 5.3.1 Symmetric key generation and encryption

Before encrypting an envelope payload, Corner 1 MUST generate a unique and random cryptographic symmetric key of the specified algorithm and size, and MUST encrypt the key using RSA-OAEP with the public key certificate published by Corner 4. The encrypted key MUST be included in the EncryptedKey element of the XML Encryption structure. The Algorithm attribute of the EncryptionMethod of the EncryptedKey element MUST be set to:

http://www.w3.org/2009/xmlenc11#rsa-oaep

The use of the KeyName element is OPTIONAL.

### 5.3.2 Payload encryption

Payload encryption MUST be done using AES-256 with GCM mode in conformance with the XML Encryption Syntax and Processing Version 1.1 W3C Recommendation published here: https://www.w3.org/TR/xmlenc-core1/#sec-AES-GCM . The payload MUST be encrypted using the symmetric key generated as specified in section 5.3.1.

The value of the InstanceEncryptionMethod element of the XHE Payload container containing the encrypted payload MUST be set to:

http://www.w3.org/2009/xmlenc11#aes256-gcm

## 5.4 Use of XML Encryption

The symmetric key and the encrypted payload MUST be packaged within an XML EncryptedData Encryption structure in conformance with the XML Encryption Syntax and Processing Version 1.1 W3C Recommendation as published here: https://www.w3.org/TR/xmlenc-core1.

The XML Encryption structure MUST use the following namespace:

http://www.w3.org/2001/04/xmlenc#

All XML Encryption occurrences MUST be schema valid.

## 5.5 Validation of encrypted payloads

Payload encryption facilitates confidentiality between senders (Corner 1) and receivers (Corner 4) of business documents by concealing their content from intermediaries, including from Access Points (Corners 2 and 3). Consequently, the logical tasks of ensuring business document validity, such as business rule, schema, and other

validations, are necessarily associated with the premises of Corners 1 and 4 rather with their respective Access Point service providers.

Notwithstanding, the application of payload encryption SHALL NOT revoke any responsibilities or obligations to send valid business documents through the BPC network, such as those defined in the network policies. Network Access Points and their end-users need to address how to ensure business document validity when sending as encrypted as the payload of an envelope.

# 6 Envelope signing

Business document envelopes SHOULD NOT be digitally signed. The application of a digital signature SHALL NOT give any legal and/or technical significance or meaning to the envelope.

# 7 Appendix A: Example envelope (non-normative)

```
<?xml version="1.0" encoding="UTF-8"?>
<XHE xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://docs.oasis-open.org/bdxr/ns/XHE/1/ExchangeHeaderEnvelope"
  xmlns:xha="http://docs.oasis-open.org/bdxr/ns/XHE/1/AggregateComponents"
  xmlns:ext="http://docs.oasis-open.org/bdxr/ns/XHE/1/ExtensionComponents"
  xmlns:xhb="http://docs.oasis-open.org/bdxr/ns/XHE/1/BasicComponents">
  <xhb:XHEVersionID>1.0</xhb:XHEVersionID>
  <xhb:CustomizationID schemeID="bdx-docid-qns">http://docs.oasis-
open.org/bdxr/ns/XHE/1/ExchangeHeaderEnvelope::XHE##bpc-envelope-
1.0</xhb:CustomizationID>
  <xhb:ProfileID>bpc-envelope-1.0</xhb:ProfileID>
  <xha:Header>
    <xhb:ID>100001</xhb:ID>
    <xhb:CreationDateTime>2021-08-19T10:14:00Z</xhb:CreationDateTime>
    <xha:FromParty>
      <xha:PartyIdentification>
        <xhb:ID schemeID="urn:oasis:names:tc:ebcore:partyid-
type:iso6523:0088">0123456789012</xhb:ID>
      </xha:PartyIdentification>
    </xha:FromParty>
    <xha:ToParty>
      <xha:PartyIdentification>
        <xhb:ID schemeID="urn:oasis:names:tc:ebcore:partyid-
type:iso6523:0060">123456789</xhb:ID>
      </xha:PartyIdentification>
    </xha:ToParty>
  </xha:Header>
  <xha:Payloads>
    <xha:Payload>
      <xhb:ID>1</xhb:ID>
      <xhb:Description>This is an invoice</xhb:Description>
      <xhb:ContentTypeCode
listID="MIME">application/xml</xhb:ContentTypeCode>
      <xhb:CustomizationID schemeID="bdx-docid-
qns">urn:oasis:names:specification:ubl:schema:xsd:Invoice-2::Invoice##BPC-
Invoice-1.0</xhb:CustomizationID>
      <xhb:ProfileID schemeID="bpc-bus-profiles">bpc-invoice-profile-
1.0</xhb:ProfileID>
      <xhb:InstanceEncryptionIndicator>false</xhb:InstanceEncryptionIndicat
or>
      <xha:PayloadContent>
        <Invoice xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
          xmlns="urn:oasis:names:specification:ubl:schema:xsd
:Invoice-2"
          xmlns:cac="urn:oasis:names:specification:ubl:schema:xsd:CommonAgg
regateComponents-2"
          xmlns:cbc="urn:oasis:names:specification:ubl:schema
:xsd:CommonBasicComponents-2">
          <!-- UBL invoice, removed for brevity -->
        </Invoice>
      </xha:PayloadContent>
    </xha:Payload>
    <xha:Payload>
      <xhb:ID>2</xhb:ID>
      <xhb:Description>This is an associated PDF file sent
encrypted as an attachment to the invoice</xhb:Description>
      <xhb:ContentTypeCode
listID="MIME">application/pdf</xhb:ContentTypeCode>
      <xhb:InstanceEncryptionIndicator>true</xhb:InstanceEncr
yptionIndicator>
      <xhb:InstanceEncryptionMethod>http://www.w3.org/2009/xm
lenc11#aes256-gcm</xhb:InstanceEncryptionMethod>
      <xha:PayloadContent>
        <!-- XML Encryption structure,
                        removed for brevity -->
      </xha:PayloadContent>
    </xha:Payload>
    <xha:Payload>
      <xhb:ID>3</xhb:ID>
      <xhb:Description>This is a reference to a payload
available at an external location</xhb:Description>
      <xhb:ContentTypeCode
listID="MIME">image/svg+xml</xhb:ContentTypeCode>
      <xhb:InstanceEncryptionIndicator>false</xhb:InstanceEnc
ryptionIndicator>
      <xha:PayloadExternalReference>
        <xhb:ID>https://businesspaymentscoalition.org/wp-
content/uploads/bpc-logo-svg.svg</xhb:ID>
      </xha:PayloadExternalReference>
    </xha:Payload>
  </xha:Payloads>
</XHE>
```