

EXCHANGE NETWORK DOCUMENT HEADER SPECIFICATION VERSION 2.0

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1 Introduction

The Exchange Network Header version 2.0 provides the capability to append descriptions and process instructions to a document seamlessly without the need to change data schemas. The header provides basic metadata including: (1) descriptions of the payload; (2) routing information for documents transferred across the Exchange Network; and (3) additional information such as creator, a timestamp, and a description of the payload content. It may also be used to describe what operations are to be performed by the receiver and to notify the sender of processing errors.

This document includes an explanation of the expected usage of the Header 2.0 on the Exchange Network and the Header 2.0 specification. In addition, a practical introduction to using the header and an Appendix with complete examples of the Header and Payload are provided.

1.1 When to use the Header on the Exchange Network

With the release of the Header 2.0 specification, the header will be required for all Submit operations on the Network (i.e., whenever a payload is sent using Submit, the payload must include the header) for new flows and to flows undergoing major version upgrades. Flows currently in production do not need to update their usage of the header until their next major business-driven upgrade. Please refer to the Principles, Rules, and Procedures for Change Management for more information on flow versioning requirements.

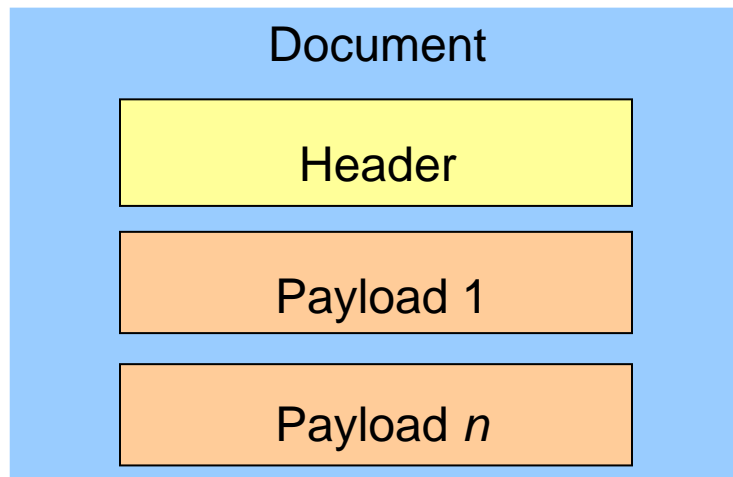
For all other payloads sent over the Exchange Network, such as the payload sent in response to a Query, use of the header is optional on a Service-by-Service basis. The Flow Configuration Document (FCD) for each flow explains whether the header is required or optional and its use for each Data Service.

2 Exchange Network Document Structure

An Exchange Network Document is an XML document that contains the document header and typically one data payload. The root tag of the document is Document and the first child is the header, followed by one or more payload elements. A payload is defined as any XML element that is governed by an XML schema. For most flows, only one payload per document header is needed, however this specification supports the use of multiple headers. Please refer to your flow documentation for implementation details if more than one payload per header is needed.

Note that parsing the entire document can cause significant performance degradation, particularly on documents with large payloads. Refer to section 5.7 below for more details.

The structure of the document is shown in the following figure:



3 Exchange Network Document Specification

3.1 Namespace and Schema

The XML namespace for the Exchange Network Document is

<http://www.exchangenetwork.net/schema/header/2>

All documents that use the Header 2.0 specification must use this namespace URL.

The schema file is located at:

http://www.exchangenetwork.net/schema/header/2/header_v2.0.xsd

3.2 Document Header Definitions

The document header is the first child of the Document tag. A header may contain the elements and attributes defined below:

Element Name	Required	Example
AuthorName: Originator of the document. This should be the name of a person or a network node ID if the document is automatically generated.	Yes	John Smith
OrganizationName: The organization to which the author belongs. It may be a state name, an organization name or a company name. For submissions to the CDX node, this should be the name of the organization.	Yes	Network Service Inc.
DocumentTitle: Title of the document.	Yes	NEI 2006 Submission
CreationDateTime: This is a timestamp that marks when the document, including payloads and header part, was created.	Yes	2006-04-05T09:30:47-05:00
Keywords: Words that best describe the payload. Multiple keywords should be separated by commas. This is for transaction categorization and searching.	No	Air Quality, Howard County, Emission Data.
Comment: Additional comments for processors.	No	The payload contains Point Data.
DataFlowName: The name of the data flow associated with the payload. It could be the name of the data source for Query results.	No	NEI_POINT_V3.0

DataServiceName: Name of a data service that generated the document. This is the name of the procedure that was used to initiate the creation of the payload. This would apply only for Query and Solicit and would not be applicable for Download and Submit.	No	NEI.GetNEIDataByYear_v3
SenderContact: The sender's additional contact information. It could contain sender's electronic address and/or telephone numbers where the author can be reached.	No	P.O. Box1234 Washington, DC 20001 202-123-4567
ApplicationUserIdentifier: The user ID for the backend system if it is different from the NAAS user ID.	No	QTEC123
SenderAddress: A well-formed URI where result/report can be sent. Currently the Network will make use of the Notification mechanism at the Document Level as described in the Protocol and Specification. Note that this could contain multiple addresses, including that of the submitter and/or other technical people related to contents of the payload.	No	mailto:jsmith@example.com
Property: Other properties of the document (use name value pairs). This is an extension mechanism to cover any other elements that are not defined in the specification.	No	<hdr:Property> <hdr:PropertyName>InventoryYear</hdr:PropertyName> <hdr:PropertyValue>2002</hdr:PropertyValue> </hdr:Property>
Signature: An XML signature associated with the document (Use http://www.w3.org/2000/09/xmlsig#)	No	See samples in the Appendix.
id: A unique identifier for the document. This is an attribute of ExchangeNetworkDocument and provides a unique Id for each document in the payload.	Yes	MyDocumentId0001

3.3 Document Payload

The Payload element provides a wrapper for any XML contents governed by an XML schema, including encrypted contents.

The actual contents should be the first and only child of the Payload element. The Payload element has the following optional attributes:

General Attributes:

- **id**: This is a unique identifier for the payload. If there are multiple payloads in a document, an id should be supplied for each.
- **operation**: An operation to be carried out by the receiver. It is usually a database operation such as Refresh, Add, Delete or Update. The actual value depends on the data flow, and should be defined by an IPT.

4 Using the Document Header

4.1 The Header Namespace

The Exchange Network Header has its own namespace, although the payload may use one or more schemas in different namespaces. Since the header portion is usually much smaller than the actual payload, we recommend that users choose the payload namespace as the default namespace in the payload element, but use a qualified element for the header. The following example shows the namespace usage of the header and payload:

```
<hdr:ExchangeNetworkDocument id="MySubmission0123"
xmlns:hdr="http://www.exchangenetwork.net/schema/header/2">
  <hdr:Header>
    <!-- header elements, qualified, are here. -->
  </hdr:Header>
  <hdr:Payload operation="Update">
    <MyPayloadElement
xmlns="http://www.exchangenetwork.net/schema/mypayload/2">
      <!-- payload elements, unqualified,
are here. -->
    </MyPayloadElement>
  </hdr:Payload>
</hdr:ExchangeNetworkDocument>
```

In order to better support interactive clients, Network nodes should provide as much information as possible on the result set when a Query is requested.

4.2 Operation Identifier

A payload may have an operation attribute, which indicates the desired operation for the backend databases. The operation attribute is typically used by the data submission process to a network node.

The operation attribute can have one of the following string values:

- 'Insert': The data set is to be inserted into the target database. It is an error condition if a record already exists in the target database.
- 'Update': The data set is for making changes to existing records in the target database. It is an error condition if a record in the dataset does not exist in the target database.
- 'Delete': The data set contains information for removing records from the target database.
- 'Refresh': The data set contains a complete refresh of the existing database or tables. It typically requires the target database to purge all the existing record and then insert the data set.
- 'Merge': The data set contains records that should be merged into the target database. A record should be inserted into the database if it does not exist; otherwise it should be updated.

Actual operations that are supported by a dataflow should be documented by the IPT in the FCD of the dataflow.

4.3 Document Security

The Exchange Network Document specification supports document security using XML signature and XML encryption. This section discusses how encryption and signature should be applied to the header and payload.

4.3.1 Encryption

If encryption is required for a data exchange, as documented in the FCD, only the payload should be encrypted, i.e., the first child of the payload element should be encrypted using the applicable receiver's public key. The header part of the document must not be encrypted as it does not contain sensitive information.

4.3.2 Signature

When only one signature is required, the entire document, including header and payload, should be signed using the enveloped signature defined in the XML signature specification. This ensures the integrity and nonrepudiation of the whole document. The signature should be inserted in the document header. The hash of an enveloped signature is calculated using the entire document

excluding the signature element. Therefore, insertion of the signature in the header will not change the hash value and thus will not invalidate the signature.

4.4 Versioning and Compatibility

Header 2.0 schema is a major update over the previous schema, and it is not compatible to the version 1.0 implementations. Network nodes are encouraged to continue to support the old header in the current production systems while implementing Header 2.0 for all new data flows.

4.5 Tools and Support

CDX will provide Microsoft .NET and Java implementations of the document Header 2.0, which will serialize and deserialize document headers from an ExchangeNetworkDocument.

The Node Client SDK will also be enhanced to support the document header 2.0 structures.

Since the payload may be very large, implementers of this specification are encouraged to parse only the header part of a document using a stream parser or a SAX parser. Parsing the entire document could incur significant performance degradations.

5 Appendix

5.1 Exchange Network Document Schema

The following is the complete XML Schema definition of the Exchange Network Document 2.0:

```
"<MyResultSet xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://www.exchangenetwork.net/schema/myresults/3">
    <!-- All the records are here -->
</MyResultSet?><MyResultSet
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://www.exchangenetwork.net/schema/myresults/3">
    <!-- All the records are here -->
</MyResultSet>"

<?xml version="1.0" encoding="UTF-8" ?>
<schema
targetNamespace="http://www.exchangenetwork.net/schema/header/2"
xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:hdr="http://www.exchangenetwork.net/schema/header/2"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="2.0">
  <import namespace="http://www.w3.org/2000/09/xmldsig#"
schemaLocation="http://www.w3.org/TR/xmldsig-core/xmldsig-core-
schema.xsd" />
  <annotation>
    <documentation>
      Schema Name : header_v2.0.xsd
      Current Version Available At :
http://www.exchangenetwork.net/scheam/header/2
      Description : The Exchange Network Document Header Definition.
      Technical Contact : Yunhao Zhang (yzhang2006@gmail.com).
    </documentation>
  </annotation>
  <complexType name ="NameValuePair">
    <sequence>
      <element name ="PropertyName" type ="string" />
      <element name ="PropertyValue" type ="anyType" />
    </sequence>
  </complexType>
  <simpleType name="OperationCodeType">
    <restriction base="string">
      <enumeration value="None" />
      <enumeration value="Refresh" />
      <enumeration value="Insert" />
      <enumeration value="Update" />
      <enumeration value="Delete" />
      <enumeration value="Merge" />
    </restriction>
  </simpleType>
  <complexType name="DocumentHeaderType">
```

```

    <sequence>
      <element name="AuthorName" type="string" maxOccurs="1"/>
      <element name="OrganizationName" type="string" maxOccurs="1"/>
      <element name="DocumentTitle" type="string" maxOccurs="1"/>
      <element name="CreationDateTime" type="dateTime" maxOccurs="1"/>
      <element name="Keywords" type="string" minOccurs="0"
maxOccurs="1"/>
      <element name="Comment" type="string" minOccurs="0"
maxOccurs="1"/>
      <element name="DataFlowName" type="string" minOccurs="0"
maxOccurs="1"/>
      <element name="DataServiceName" type="string" minOccurs="0"
maxOccurs="1"/>
      <element name="SenderContact" type="string" minOccurs="0"
maxOccurs="1"/>
      <element name="ApplicationUserIdentifier" type="string"
minOccurs="0" maxOccurs="1"/>
      <element name="SenderAddress" type="anyURI" minOccurs="0"
maxOccurs="unbounded"/>
      <element name="Property" type="hdr:NameValuePair" minOccurs="0"
maxOccurs="unbounded"/>
      <element ref="ds:Signature" minOccurs="0"/>
    </sequence>
  </complexType>
  <complexType name="DocumentPayloadType">
    <sequence>
      <any minOccurs="1" maxOccurs="1" processContents="lax" />
    </sequence>
    <attribute name="id" type="ID" use="optional"/>
    <attribute name="operation" type="string" use="optional"/>
  </complexType>
  <complexType name="ExchangeNetworkDocumentType">
    <sequence>
      <element name="Header" type="hdr:DocumentHeaderType"/>
      <element name="Payload" type="hdr:DocumentPayloadType"
minOccurs="1" maxOccurs="unbounded" />
    </sequence>
    <attribute name="id" type="ID" use="required"/>
  </complexType>
  <element name="Document" type="hdr:ExchangeNetworkDocumentType" >
    <annotation>
      <documentation>The root element of an Exchange Network
Document.</documentation>
    </annotation>
  </element>
</schema>

```

5.2 Sample Document with Header

The example below shows a typical data submission using the Exchange Network Document format:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```

<!-- edited with Visual Studio 8 by Dr. Yunhao Zhang
      Note: The payload is just a sample associated with a fake schema.--
>
<hdr:Document
xmlns:hdr="http://www.exchangenetwork.net/schema/header/2"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" id="ID02">
  <hdr:Header>
    <hdr:AuthorName>John Smith</hdr:AuthorName>
    <hdr:OrganizationName>Environmental Quality Group,
Ltd.</hdr:OrganizationName>
    <hdr:DocumentTitle>Emission Submission 2006</hdr:DocumentTitle>
    <hdr:CreationDateTime>2006-04-05T09:30:47-
05:00</hdr:CreationDateTime>
    <hdr:Keywords>Emission, Clean Air</hdr:Keywords>
    <hdr:Comment>This demonstrates the usages of XML Encryption and
Signature.</hdr:Comment>
    <hdr:DataServiceName>GetSubmissionDataByFlow</hdr:DataServiceName>
    <hdr:SenderContact>PO Box 431112, Washington, DC 20001, (202)-123-
4567</hdr:SenderContact>
    <hdr:SenderAddress>mailto:jsmith@example.com</hdr:SenderAddress>

    <hdr:Property>
      <hdr:PropertyName>GeographicCoverageState</hdr:PropertyName>
      <hdr:PropertyValue>01</hdr:PropertyValue>
    </hdr:Property>
    <hdr:Property>
      <hdr:PropertyName>FiscalQuarter</hdr:PropertyName>
      <hdr:PropertyValue>2</hdr:PropertyValue>
    </hdr:Property>
  </hdr:Header>
  <hdr:Payload operation="Original">
    <PointSourceSubmissionGroup
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://www.epa.gov/exchangenetwork/nei/point/3"
schemaVersion="3.0"> Parts included for illustration only
      <TransmittalRecordTypeCode>TR</TransmittalRecordTypeCode>

      <CountyStateFIPSCode>31025</CountyStateFIPSCode>
        <OrganizationFormalName>Organization For
ENVIRONMENTAL QUALITY</OrganizationFormalName>
        <TransactionTypeCode>00</TransactionTypeCode>
        <InventoryYear>2006</InventoryYear>
        <InventoryTypeCode>EMIS</InventoryTypeCode>

      <TransactionCreationDate>20040402</TransactionCreationDate>
        <SubmissionNumber>0001</SubmissionNumber>
        <TransactionComment>test
submission</TransactionComment>
        <IndividualFullName>John
Smith</IndividualFullName>
        <TelephoneNumber>202 123-4567</TelephoneNumber>

      <TelephoneNumberTypeName>Office</TelephoneNumberTypeName>

      <ElectronicAddressText>jsmith@example.com</ElectronicAddressText>

      <ElectronicAddressTypeName>Email</ElectronicAddressTypeName>

```

```

        <SourceTypeCode>POINT</SourceTypeCode>
        <AffiliationTypeText>Report
Certifier</AffiliationTypeText>
        <FormatVersionNumber>3.0</FormatVersionNumber>
        <TribalCode>000</TribalCode>
    </TransmittalSubmissionGroup>
    <SiteSubmissionGroup schemaVersion="3.0">
        <SiteRecordTypeCode>SI</SiteRecordTypeCode>
    </hdr:Payload>
</hdr:Document>

```

5.3 Sample Encrypted Document with Signature

The following example demonstrates how to use XML encryption and XML signature in the Exchange Network Document. Note that the payload is encrypted first and the entire document, including the header, is signed using the sender's private key afterwards.

```

<hdr:Document
xmlns:hdr="http://www.exchangenetwork.net/schema/header/2"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" id="ID02">
  <hdr:Header>
    <hdr:AuthorName>John Smith</hdr:AuthorName>
    <hdr:OrganizationName>Environmental Quality Group,
Ltd.</hdr:OrganizationName>
    <hdr:DocumentTitle>Emission Submission 2006</hdr:DocumentTitle>
    <hdr:CreationDateTime>2006-04-05T09:30:47-
05:00</hdr:CreationDateTime>
    <hdr:Keywords>Emission, Clean Air</hdr:Keywords>
    <hdr:Comment>This demonstrates the usages of XML Encryption and
Signature.</hdr:Comment>
    <hdr:DataServiceName>GetSubmissionDataByFlow</hdr:DataServiceName>
    <hdr:SenderContact>PO Box 431112, Washington, DC 20001, (202)-123-
4567</hdr:SenderContact>
    <hdr:SenderAddress>mailto:jsmith@example.com</hdr:SenderAddress>

    <hdr:Property>
      <hdr:PropertyName>GeographicCoverageState</hdr:PropertyName>
      <hdr:PropertyValue>01</hdr:PropertyValue>
    </hdr:Property>
    <hdr:Property>
      <hdr:PropertyName>FisicalQuarter</hdr:PropertyName>
      <hdr:PropertyValue>2</hdr:PropertyValue>
    </hdr:Property>
    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#"
Id="_35df5cb9-f033-4533-bf4f-b3a36ae892d6">
      <SignedInfo>
        <CanonicalizationMethod
Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#" />
        <SignatureMethod
Algorithm="http://www.w3.org/2000/09/xmldsig#rsa-sha1" />
        <Reference URI="">
          <Transforms>
            <Transform
Algorithm="http://www.w3.org/2000/09/xmldsig#enveloped-signature" />

```

```

        </Transforms>
        <DigestMethod
Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
        <DigestValue>XIFT/GUkOIxrl dhfvWsgY+XacjA=</DigestValue>
        </Reference>
    </SignedInfo>
    <SignatureValue>

gwkMbTxke2iZov/FE+7FjisiNF0ABdjiuN2+6fladWtv0i0JAOvWKDaE0zDnV0kO

ltr5zZRG6ME4XFPqhaY5ZUSjarv2Fmjy6l1BBW35fuS4OX2RHGqVzblhfQJKxvh+
wKqdcscr9ZxaH5SiPVRpOoPPzssvVB0d36to2vboT5Y=
    </SignatureValue>
    <KeyInfo>
        <KeyName>US, DC, Washington, Exchange Network, Security
Service, Yunhao Zhang</KeyName>
        <KeyValue>
            <RSAKeyValue>
                <Modulus>

qZrI1ilbLPwhBVe40piZRzj/8FwasGppeEjbBymlnQApMr9ZsdRR9VrpZ7m4+iMPB

WTC24bOaUefA7QygGXDM4WlEKK6YQGGDNRqiqIFxLYRIPCzPSaT+utfrfFEpiFrQ
9M6HYa1bjb/u00To/UXQ9hzpOrnXgSLMpuM6B0tikuc=
                </Modulus>
                <Exponent>
                    Aw==
                </Exponent>
            </RSAKeyValue>
        </KeyValue>
    </KeyInfo>
</Signature>
</hdr:Header>
    <hdr:Payload operation="Original" id="MyPayload000134">
        <EncryptedData xmlns="http://www.w3.org/2001/04/xmlenc#"
Type="http://www.w3.org/2001/04/xmlenc#Element">
            <EncryptionMethod
Algorithm="http://www.w3.org/2001/04/xmlenc#aes128-cbc"/>
            <KeyInfo xmlns="http://www.w3.org/2000/09/xmldsig#">
                <EncryptedKey xmlns="http://www.w3.org/2001/04/xmlenc#">
                    <EncryptionMethod
Algorithm="http://www.w3.org/2001/04/xmlenc#rsa-1_5"/>
                    <KeyInfo xmlns="http://www.w3.org/2000/09/xmldsig#">
                        <KeyName>US, DC, Washington, Exchange Network, Security
Service, Yunhao Zhang</KeyName>
                    </KeyInfo>
                <CipherData>
                    <CipherValue>

Uw0/nM5nOiZwBc3I/TYewGuxNSGBZQrEarPrenZ2eIA65zBDBDgaL3zkw+bE/5Wk

WwRI73e+S5cav5GRe7aDrQTgkeB2WXEKgVz81i85Ycq/huyHgCuKBst+9X5/eiPO
tIlHsDqxM67AergCiM/RxgWbtEo5fOScQbN6wj7qw=
                    </CipherValue>
                </CipherData>
            </EncryptedKey>
        </KeyInfo>
    </hdr:Payload>

```

```

    <CipherData>
      <CipherValue>

cmy7z0vnI3P3MokHsBD2M6U7iuKDNR0pqLUOgxMrF6QaoJ9iGA803PHTCp1ZQvss

T97RfageaPuqAh36rvUSyMXzOIxxzOEH/AG2IcTs61P3MpWDmA74W0l0uV+ZH1uf
svx2sp0sBVY1ZZME15rSETnJk+RDA1PADpcbCg==
      </CipherValue>
    </CipherData>
  </EncryptedData>
</hdr:Payload>
</hdr:Document>

```

5.4 Sample Query Result with Header

The following demonstrates how to use document header to provide additional information about a query result set:

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with Visual Studio 8 by Dr. Yunhao Zhang
      Note: The payload is just a sample associated with a fake schema.--
>
<hdr:Document
  xmlns:hdr="http://www.exchangenetwork.net/schema/header/2"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" Id="ID02">
  <hdr:Header>
    <hdr:AuthorName>Central Data Exchange</hdr:AuthorName>
    <hdr:OrganizationName>Environmental Protection
Agency</hdr:OrganizationName>
    <hdr:DocumentTitle>Daily Air Quality Data</hdr:DocumentTitle>
    <hdr:CreationDateTime>2006-04-05T09:30:47-
05:00</hdr:CreationDateTime>
  </hdr:Header>
  <!-- the result set contains 50 records starting from 100, and there
are more records available.-->
    <hdr:Payload operation="Query" >
      <MyResultSet xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xmlns="http://www.exchangenetwork.net/schema/myresults/3">
        <!-- All the records are here -->
      </MyResultSet>
    </hdr:Payload>
  </hdr:Document>

```