Message Service Specification

ebXML Transport, Routing & Packaging

Version 1.05

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Status of this Document

This document specifies an ebXML DRAFT for the eBusiness community. Distribution of this document is unlimited.

The document formatting is based on the Internet Society's Standard RFC format converted to Microsoft Word 2000 format.

Note: implementers of this specification should consult the OASIS ebXML Messaging Services Technical Committee web site for current status and revisions to the specification (http://www.oasis-open.org/committees/ebxml-msg/).

Specification

Version 1.0 of this Technical Specification document was approved by the ebXML Plenary in May, 2001.

This material fulfills requirements of the ebXML Requirements document.

This version

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Latest version

http://www.ebxml.org/specs/index.htm

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1 Introduction

This specification is one of a series of specifications that realize the vision of creating a single global electronic marketplace where enterprises of any size and in any geographical location can meet and conduct business with each other through the exchange of XML based messages. The set of specifications enable a modular, yet complete electronic business framework.

This specification focuses on defining a communications-protocol neutral method for exchanging the electronic business messages. It defines specific enveloping constructs that support reliable, secure delivery of business information. Furthermore, the specification defines a flexible enveloping technique that permits ebXML-compliant messages to contain payloads of any format type. This versatility ensures that legacy electronic business systems employing traditional syntaxes (i.e. UN/EDIFACT, ASC X12, or HL7) can leverage the advantages of the ebXML infrastructure along with users of emerging technologies

1.1.1 Summary of Contents of this Document

This specification defines the *ebXML Message Service Protocol* that enables the secure and reliable exchange of messages between two parties. It includes descriptions of:

- the ebXML Message structure used to package payload data for transport between parties
- the behavior of the Message Service Handler that sends and receives those messages over a data communication protocol.

This specification is independent of both the payload and the communication protocol used, although Appendices to this specification describe how to use this specification with [HTTP] and [SMTP].

This specification is organized around the following topics:

Core Components

- **Packaging Specification** – A description of how to package an ebXML Message and its associated parts into a form that can sent using a communications protocol such as HTTP or SMTP (section 1.3)
- **ebXML SOAP Extensions** – A specification of the structure and composition of the information necessary for an *ebXML Message Service* to successfully generate or process an ebXML Message (section 2)
- **Error Handling** – This section describes how one *ebXML Message Service* reports errors it detects to another ebXML Message Service Handler (section 4.2.3)
- **Security** – This provides a specification of the security semantics for ebXML Messages (section 4).

Optional Elements

- **Delivery Receipts** – The From Party MSH can request a Delivery Receipt from the To Party MSH.
- **Reliable Messaging** – The Reliable Messaging function defines an interoperable protocol such that any two Message Service implementations can "reliably" exchange messages that are sent using "reliable messaging" once-and-only-once delivery semantics (section 11.1)
- **Message Service Handler Services** – A description of services that enable one service to discover the status of another Message Service Handler (MSH) or an individual message (section 8)
- **Message Ordering** – The Order of message receipt by the To Party MSH can be guaranteed.
- **Multi-Hop –** Messages may be sent through intermediary MSH nodes.

Appendices to this specification cover the following:

- **Appendix A Schema** – This normative appendix contains [XMLSchema] for the ebXML SOAP ***Header*** and ***Body***.
- **Appendix B Communication Protocol Envelope Mappings** – This normative appendix describes how to transport *ebXML Message Service* compliant messages over [HTTP] and [SMTP]
- **Appendix C Security Profiles** – a discussion concerning Security Profiles.

1.1.2 Document Conventions

Terms in *Italics* are defined in the ebXML Glossary of Terms [ebGLOSS]. Terms listed in ***Bold Italics*** represent the element and/or attribute content. Terms listed in `Courier` font relate to MIME components. Notes are listed in Times New Roman font and are informative (non-normative).

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in [RFC2119] as quoted here:

Note: the force of these words is modified by the requirement level of the document in which they are used.

- *MUST: This word, or the terms "REQUIRED" or "SHALL", means that the definition is an absolute requirement of the specification.*
- *MUST NOT: This phrase, or the phrase "SHALL NOT", means that the definition is an absolute prohibition of the specification.*
- *SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.*
- *SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.*
- *MAY: This word, or the adjective "OPTIONAL", mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)*

1.1.3 Audience

The target audience for this specification is the community of software developers who will implement the *ebXML Message Service*.

1.1.4 Caveats and Assumptions

It is assumed that the reader has an understanding of transport protocols, MIME, XML, SOAP, SOAP Messages with Attachments and security technologies.

All examples are to be considered non-normative. If inconsistencies exist between the specification and the examples, the specification supersedes the examples.

1.1.5 Related Documents

The following set of related specifications are developed independent of this specification as part of the ebXML initiative:

- **ebXML Message Services Requirements Specification**[ebMSREQ] – defines the requirements of these Message Services
- **ebXML Technical Architecture Specification**[ebTA] – defines the overall technical architecture for ebXML
- **ebXML Technical Architecture Risk Assessment Technical Report** [secRISK] – defines the security mechanisms necessary to negate anticipated, selected threats
- **ebXML Collaboration Protocol Profile and Agreement Specification**[ebCPP] - defines how one party can discover and/or agree upon the information that party needs to know about another party prior to sending them a message that complies with this specification

- **ebXML Registry/Repository Services Specification**[ebRS] – defines a registry service for the ebXML environment

1.2 Concept of Operation for Message Servicing

1.2.1 Scope

The ebXML Message Service [ebMS] defines the message enveloping and header document schema used to transfer ebXML messages over a communications protocol such as HTTP or SMTP and the behavior of the software that sends and receives ebXML messages. The ebMS is defined as a set of layered extensions to the base Simple Object Access Protocol [SOAP] and SOAP Messages with Attachments [SOAPATTACH] specifications. The ebMS provides security and reliability features necessary to support international electronic business. These security and reliability features are not provided in the SOAP or SOAPATTACH specifications.

The ebXML infrastructure is composed of several independent, but related, components. Specifications for the individual components are fashioned as stand-alone documents. The specifications are totally self-contained; nevertheless, design decisions within one document can and do impact the other documents. Considering this, the ebMS is a closely coordinated definition for an ebXML message service handler [MSH].

The ebMS component provides the message packaging, routing, and transport facilities for the ebXML infrastructure. The ebMS is not defined as a physical component, but rather as an abstraction of a process. An implementation of this specification could be delivered as a wholly independent software application or an integrated component of some larger business process.

1.2.2 Background and Objectives

Traditional business information exchanges have conformed to a variety of standards-based syntaxes. These exchanges were largely based on electronic data interchange (EDI) standards born out of mainframe and batch processing. Some of the standards defined bindings to specific communications protocols. These EDI techniques worked well; however, they were difficult and expensive to implement. Therefore, use of these systems was normally limited to large enterprises that possessed mature information technology capabilities.

The proliferation of XML-based business interchanges served as the catalyst for defining a new global paradigm that ensured all business activities, regardless of size, could engage in electronic business activities. The prime objective of ebMS is to facilitate the exchange of electronic business messages within an XML framework. Business messages, identified as the ‘payloads’ of the ebXML messages, are not necessarily expressed in XML. XML-based messages, as well as traditional EDI formats, are transported by the ebMS. Actually, the ebMS payload can take any digital form—XML, ASC X12, HL7, AIAG E5, database tables, or binary image files.

The ebXML architecture requires that the ebXML Message Service protocol be capable of being carried over any available transport protocol. Therefore, the ebMS does not mandate use of a specific transport protocol. This version of the specification provides bindings to HTTP and SMTP, but other protocols can and reasonably will be used.

The ebXML Requirements Specification [ebRS] mandates the need for secure, reliable communications. The ebXML work focuses on leveraging existing and emerging technology—attempts to create new protocols are discouraged. Therefore, the ebMS defines security within the context of existing security standards and protocols. Those requirements that can be satisfied with existing standards are specified in the ebMS, others must be deferred until new technologies or standards are available, for example encryption of individual message header elements.

Reliability requirements defined in the ebRS relate to delivery of ebXML messages over the communications channels. The ebMS provides mechanisms to satisfy the ebRS requirements. The reliable messaging elements of the ebMS supply reliability to the communications layer; they are not intended as business-level acknowledgments to the applications that are supported by the ebMS. This is an important distinction. Business processes often anticipate responses to messages they generate. The responses may take the form of a simple acknowledgment of message receipt by the application that received the message or a companion message that reflects action on the original message. Those messages are outside of the requirements defined for the MSH. The acknowledgment defined in this specification does not indicate that the payload of the ebXML message was syntactically correct. It does not acknowledge the accuracy of the payload information. It does not indicate business acceptance of the information or agreement with the content of the payload. The ebMS is designed to provide the sender with the confidence that the receiving MSH has received the message intact.

The underlying architecture of the MSH assumes that messages are exchanged between two ebMS-compliant MSH nodes. This pair of MSH nodes provides a hop-to-hop model that is extended as required to support a multi-hop environment. The multi-hop environment allows for the final destination of the message to be an intermediary MSH other than the ‘receiving MSH’ identified by the original sending MSH. The ebMS architecture assumes that the sender of the message MAY be unaware of the specific path used to deliver a message. However, it MUST be assumed that the original sender has knowledge of the final recipient of the message and the first of one or more intermediary hops. The architecture also supports a business requirement to specify an ordered-set of discrete parties to whom a message is routed. The multi-hop and ordered-set options obfuscate the acknowledgment message identified in the paragraph above. It is understood that the acknowledgment does not assure delivery of the message to the final destination, only to the receiving MSH of the MSH pair.

The MSH supports the concept of ‘quality of service.’ The degree of service quality is controlled by an agreement existing between the parties directly involved in the message exchange. In practice, multiple agreements may be required between the two parties. The agreements might be tailored to the particular needs to the business exchanges. For instance, a set of business partners may have a contract that defines the message exchanges related to buying products from a domestic facility and another that defines the message exchanges for buying from an overseas facility. Alternatively, the partners might agree to follow the agreements developed by their trade association. Multiple agreements may also exist between the various parties that handle the message from the original sender to the final recipient. These agreements could include:

- an agreement between the MSH at the message origination site and the MSH at the final destination; and
- agreements between the MSH at the message origination site and the MSH acting as an intermediary; and
- an agreement between the MSH at the final destination and the MSH acting as an intermediary. There would, of course, be agreements between any additional intermediaries; however, the originating site MSH and final destination MSH MAY have no knowledge of these agreements.

The important point is that an ebMS-compliant MSH shall respect the in-force agreements between itself and any other ebMS-compliant MSH with which it communicates. In broad terms, these agreements are expressed as Collaborative Profile Agreements (CPA). This specification identifies the information that must be agreed. It does not specify the method or form used to create and maintain these agreements. It is assumed that, in practice, the actual content of the contracts may be contained in initialization/configuration files, databases, or XML documents that comply with the [ebCPP] specification.

1.2.3 Operational Policies and Constraints

The ebMS is a service that is logically positioned between one or more business applications and a communications service. This requires the definition of an abstract service interface between the business applications and the MSH. This document acknowledges the interface, but does not provide a definition for the interface. Future versions of the ebMS MAY define the service interface structure.

Bindings to two communications protocols are defined in this document; however, the MSH is specified independent of any communications protocols. While early work focuses on HTTP for transport, no preference is being provided to this protocol. Other protocols may be used and future versions of the specification may provide details related to those protocols.

The ebMS relies on external communications configuration information. This information is determined either through defined business processes or trading partner agreements. These data are captured for use within a collaboration protocol profile [CPP] or collaboration protocol agreement [CPA]. The ebXML Collaborative- Protocol Profile and Agreement Specification [ebCPP] provides definitions for the information constituting the agreements. The ebXML architecture defines the relationship between this component of the infrastructure and the ebMS. As regards the MSH, the information composing a CPP/CPA must be available to support normal operation. However, the method used by a specific implementation of the MSH does not mandate the existence of a discrete instance of a CPA. The CPA is expressed as an XML document. Some implementation may elect to populate a database with the information from the CPA and then use the database. This specification does not prescribe how the CPA information is derived, stored, or used: it only states that specific information items must be available for the MSH for successful operations.

1.2.4 Modes of Operation

This specification does not mandate how the MSH will be installed within the overall ebXML framework. It is assumed that some MSH implementations will not implement all functionality defined in this specification. For instance, a set of trading partners may not require reliable messaging services; therefore, no reliable messaging capabilities exist within their MSH. But, all MSH implementations shall comply with the specification with regard to the functions supported in the specific implementation and provide error notifications for functionality that has been requested but is not supported. Documentation for an MSH implementation SHALL identify all ebMS requirements that are not satisfied in the implementation.

The *ebXML Message Service* may be conceptually broken down into following three parts: (1) an abstract *Service Interface*, (2) functions provided by the MSH, and (3) the mapping to underlying transport service(s).

Figure 1 depicts a logical arrangement of the functional modules that exist within one possible implementation of the *ebXML Message Services* architecture. These modules are arranged in a manner to indicate their inter-relationships and dependencies.

- **Header Processing** - the creation of the ebXML Header elements for the *ebXML Message* uses input from the application, passed through the Message Service Interface, information from the *Collaboration Protocol Agreement* that governs the message, and generated information such as digital signature, timestamps and unique identifiers.
- **Header Parsing** - extracting or transforming information from a received ebXML Header element into a form that is suitable for processing by the MSH implementation.
- **Security Services** - digital signature creation and verification, authentication and authorization. These services MAY be used by other components of the MSH including the Header Processing and Header Parsing components.
- **Reliable Messaging Services** - handles the delivery and acknowledgment of ebXML Messages. The service includes handling for persistence, retry, error notification and acknowledgment of messages requiring reliable delivery.
- **Message Packaging** - the final enveloping of an *ebXML Message* (ebXML header elements and payload) into its SOAP Messages with Attachments [SOAPATTACH] container.
- **Error Handling** - this component handles the reporting of errors encountered during MSH or Application processing of a message.
- **Message Service Interface** - an abstract service interface that applications use to interact with the MSH to send and receive messages and which the MSH uses to interface with applications that handle received messages.

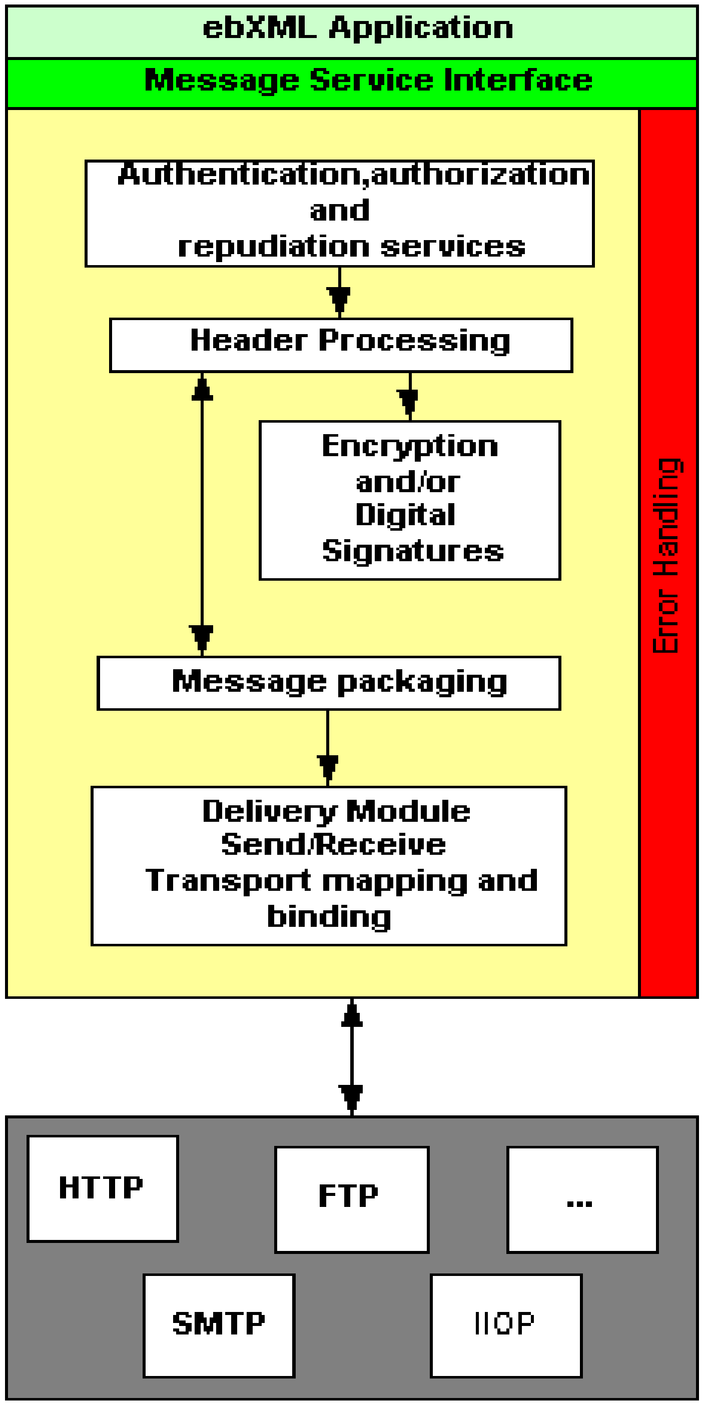

ebXML Application
Message Service Interface
Authentication,authorization and repudiation services
Header Processing
Encryption and/or Digital Signatures
Message packaging
Delivery Module Send/Receive Transport mapping and binding
Error Handling
HTTP
FTP
...
SMTP
IIOP

Figure -1 Typical Relationship between ebXML Message Service Handler Components

1.3 Packaging Specification

An ebXML Message is a communication protocol independent MIME/Multipart message envelope, structured in compliance with the SOAP Messages with Attachments [SOAPATTACH] specification, referred to as a *Message Package*.

There are two logical MIME parts within the *Message Package*:

- A MIME part, referred to as the *Header Container*, containing one SOAP 1.1 compliant message. This XML document is referred to as a *SOAP Message* for the remainder of this specification,
- zero or more MIME parts, referred to as *Payload Containers*, containing application level payloads.

The *SOAP Message* is an XML document that consists of the SOAP ***Envelope*** element. This is the root element of the XML document representing the *SOAP Message*. The SOAP ***Envelope*** element consists of the following:

- One SOAP ***Header*** element. This is a generic mechanism for adding features to a *SOAP Message*, including ebXML specific header elements.
- One SOAP ***Body*** element. This is a container for message service handler control data and information related to the payload parts of the message.

The general structure and composition of an ebXML Message is described in the following figure.

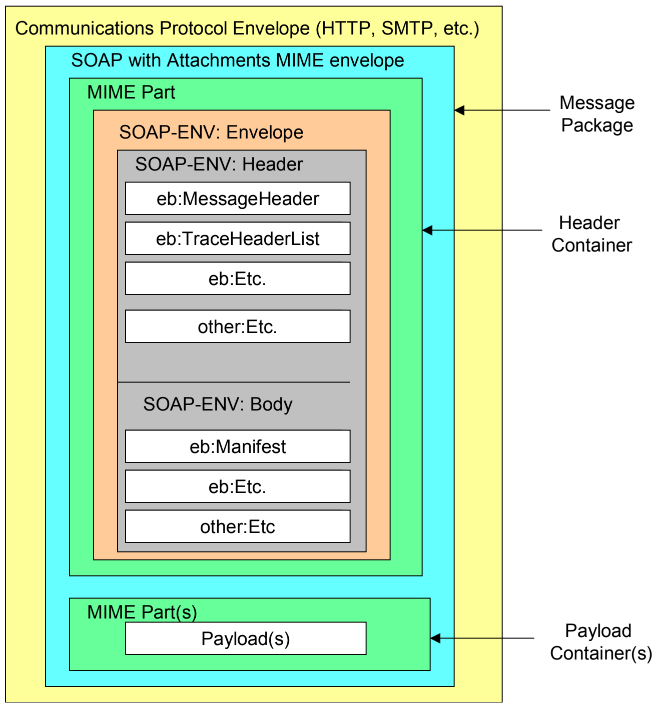


Figure 7-1 ebXML Message Structure

1.3.1 SOAP Structural Conformance

ebXML Message packaging complies with the following specifications:

- Simple Object Access Protocol (SOAP) 1.1 [SOAP]
- SOAP Messages with Attachments [SOAPATTACH]

Carrying ebXML headers in *SOAP Messages* does not mean that ebXML overrides existing semantics of SOAP, but rather that the semantics of ebXML over SOAP maps directly onto SOAP semantics.

1.3.2 Message Package

All MIME header elements of the *Message Package* are in conformance with the SOAP Messages with Attachments [SOAPATTACH] specification. In addition, the `Content-Type` MIME header in the *Message Package* contain a `type` attribute that matches the MIME media type of the MIME body part that contains the *SOAP Message* document. In accordance with the [SOAP] specification, the MIME media type of the *SOAP Message* have the value "`text/xml`."

It is strongly RECOMMENDED that the root part contain a `Content-ID` MIME header structured in accordance with [RFC2045], and that in addition to the required parameters for the Multipart/Related media type, the `start` parameter (OPTIONAL in [RFC2387]) always be present. This permits more robust error detection. For example the following fragment:

```
    Content-Type: multipart/related; type="text/xml"; boundary="boundaryValue";
    start=messagepackage-123@example.com

    --boundaryValue
    Content-ID: messagepackage-123@example.com
```

1.3.3 Header Container

The root body part of the *Message Package* is referred to in this specification as the *Header Container*. The *Header Container* is a MIME body part that MUST consist of one *SOAP Message* as defined in the SOAP Messages with Attachments [SOAPATTACH] specification.

1.3.3.1 Content-Type

The MIME `Content-Type header` for the *Header Container* MUST have the value "`text/xml`" in accordance with the [SOAP] specification. The `Content-Type` header MAY contain a "`charset`" attribute. For example:

```
    Content-Type: text/xml; charset="UTF-8"
```

1.3.3.2 charset Attribute

The MIME `charset` attribute identifies the character set used to create the *SOAP Message*. The semantics of this attribute are described in the "charset parameter / encoding considerations" of `text/xml` as specified in [XMLMedia]. The list of valid values can be found at http://www.iana.org/.

If both are present, the MIME `charset` attribute SHALL be equivalent to the encoding declaration of the *SOAP Message*. If provided, the MIME `charset` attribute MUST NOT contain a value conflicting with the encoding used when creating the *SOAP Message*.

For maximum interoperability it is RECOMMENDED that [UTF-8] be used when encoding this document. Due to the processing rules defined for media types derived from `text/xml` [XMLMedia], this MIME attribute has no default. For example:

```
    charset="UTF-8"
```

1.3.3.3 Header Container Example

The following fragment represents an example of a *Header Container*:

```
Content-ID: messagepackage-123@example.com                                ---| Header
Content-Type: text/xml;                                                      |
              charset="UTF-8"                                                |
                                                                             |
<SOAP-ENV:Envelope                                      --|SOAP Message      |
    xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">  |           |
  <SOAP-ENV:Header>                                       |                  |
    …                                                     |                  |
  </SOAP-ENV:Header>                                      |                  |
  <SOAP-ENV:Body>                                         |                  |
    …                                                     |                  |
  </SOAP-ENV:Body>                                        |                  |
</SOAP-ENV:Envelope>                                    --|                  |
---boundaryValue                                                          ---|
```

1.3.4 Payload Container

Zero or more *Payload Containers* MAY be present within a *Message Package* in conformance with the SOAP Messages with Attachments [SOAPATTACH] specification.

If the *Message Package* contains an application payload, it MUST be enclosed within a *Payload Container.*

If there is no application payload within the *Message Package* then a *Payload Container* MUST NOT be present.

The contents of each *Payload Container* MUST be identified by the ebXML Message ***Manifest*** element within the SOAP ***Body*** (see section 3.2).

The ebXML Message Service Specification makes no provision, nor limits in any way, the structure or content of application payloads. Payloads MAY be a simple-plain-text object or complex nested multipart objects. The specification of the structure and composition of payload objects is the prerogative of the organization that defines the business process or information exchange that uses the *ebXML Message Service*.

Example of a Payload Container

The following fragment represents an example of a *Payload Container* and a payload:

```
    Content-ID: <domainname.example.com>  -------------| ebXML MIME       |
    Content-Type: application/xml         -------------|                  |
                                                                          | Payload
    <Invoice>                             -------------|                  | Container
      <Invoicedata>                                    |  Payload         |
          …                                            |                  |
      </Invoicedata>                                   |                  |
    </Invoice>                            -------------|                  |
```

Note: It might be noticed that the content-type used in the preceding example (application/XML) is different than the content-type in the example SOAP envelope in section 7.3.2 above (text/XML). The SOAP 1.1 specification states that the content-type used for the SOAP envelope MUST be 'text/xml'. However, many MIME experts disagree with the choice of the primary media type designation of 'text/*' for XML documents as most XML is not "human readable" in the sense that the MIME designation of 'text' was meant to infer. They believe that XML documents should be classified as 'application/XML'.

1.3.5 Additional MIME Parameters

Any MIME part described by this specification MAY contain additional MIME headers in conformance with the [RFC2045] specification. Implementations MAY ignore any MIME header not defined in this specification. Implementations MUST ignore any MIME header that they do not recognize.

For example, an implementation could include `content-length` in a message. However, a recipient of a message with `content-length` could ignore it.

1.3.6 Reporting MIME Errors

If a MIME error is detected in the *Message Package* then it MUST be reported as specified in [SOAP].

Part I. Core Functionality

2 ebXML with SOAP

The ebXML Message Service Specification defines a set of namespace-qualified SOAP ***Header*** and ***Body*** element extensions within the SOAP ***Envelope***. In general, separate ebXML SOAP extension elements are used where:

- different software components are likely to be used to generate ebXML SOAP extension elements,
- an ebXML SOAP extension element is not always present or,
- the data contained in the ebXML SOAP extension element MAY be digitally signed separately from the other ebXML SOAP extension elements.

2.1 XML Prolog

The SOAP *Message's* XML Prolog, if present, MAY contain an XML declaration. This specification has defined no additional comments or processing instructions that may appear in the XML prolog. For example:

```
Content-Type: text/xml; charset="UTF-8"

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

2.1.1 XML Declaration

The XML declaration MAY be present in a SOAP *Message*. If present, it MUST contain the version specification required by the XML Recommendation [XML]: version='1.0' and MAY contain an encoding declaration. The semantics described below MUST be implemented by a compliant *ebXML Message Service*.

2.1.2 Encoding Declaration

If both the encoding declaration and the *Header Container* MIME charset are present, the XML prolog for the SOAP *Message* SHALL contain the encoding declaration that SHALL be equivalent to the `charset` attribute of the MIME `Content-Type` of the *Header Container* (see section 1.3.3).

If provided, the encoding declaration MUST NOT contain a value conflicting with the encoding used when creating the SOAP *Message*. It is RECOMMENDED that UTF-8 be used when encoding the SOAP *Message*.

If the character encoding cannot be determined by an XML processor using the rules specified in section 4.3.3 of [XML], the XML declaration and its contained encoding declaration SHALL be provided in the ebXML SOAP ***Header*** Document.

Note: the encoding declaration is not required in an XML document according to XML v1.0 specification [XML].

2.2 ebXML SOAP Envelope extensions

In conformance with the [SOAP] specification, all extension element content are namespace qualified. All of the ebXML SOAP extension element content defined in this specification are namespace qualified to the ebXML SOAP ***Envelope*** extensions namespace as defined in section 8.2.1.

Namespace declarations (xmlns psuedo attribute) for the ebXML SOAP extensions MAY be included in the SOAP ***Envelope***, ***Header*** or ***Body*** elements, or directly in each of the ebXML SOAP extension elements.

2.2.1 Namespace pseudo attribute

The namespace declaration for the ebXML SOAP ***Envelope*** extensions (***xmlns*** pseudo attribute) (see [XMLNamespace]) has a REQUIRED value of "http://oasis-open.org/committees/ebxml-msg/schemas/".

2.2.2 xsi:schemaLocation attribute

The SOAP namespace:

```
  http://schemas.xmlsoap.org/soap/envelope/
```

resolves to a schema that conforms to an early Working Draft version of the W3C XML Schema specification, specifically identified by the following URI:

```
  http://www.w3.org/1999/XMLSchema
```

The ebXML SOAP extension element schema has been defined using the W3C Recommendation version of the XML Schema specification[XMLSchema] (see Appendix A).

In order to enable validating parsers and various schema validating tools to correctly process and parse ebXML SOAP *Messages*, it has been necessary that the ebXML TR&P team adopt an equivalent, but updated version of the SOAP schema that conforms to the W3C Recommendation version of the XML Schema specification[XMLSchema]. ebXML MSH implementations are strongly RECOMMENDED to include the XMLSchema-instance namespace qualified ***schemaLocation*** attribute in the SOAP ***Envelope*** element to indicate to validating parsers the location of the schema document that should be used to validate the document. Failure to include the ***schemaLocation*** attribute will possibly preclude *Receiving MSH* implementations from being able to validate messages received.

For example:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://schemas.xmlsoap.org/soap/envelope/
      http://www.oasis-open.org/committees/ebxml-msg/schemas/envelope.xsd" ...>
```

In addition, ebXML SOAP ***Header*** and ***Body*** extension element content must be similarly qualified so as to identify the location that validating parsers can find the schema document that contains the ebXML namespace qualified SOAP extension element definitions. Thus, the XMLSchema-instance namespace qualified ***schemaLocation*** attribute should include a mapping of the ebXML SOAP ***Envelope*** extensions namespace to its schema document in the same element that declares the ebXML SOAP ***Envelope*** extensions namespace.

It is RECOMMENDED that use of a separate ***schemaLocation*** attribute be used so that tools that may not correctly use the ***schemaLocation*** attribute to resolve schema for more than one namespace will still be capable of validating an ebXML SOAP *message*. For example:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://schemas.xmlsoap.org/soap/envelope/
      http://www.oasis-open.org/committees/ebxml-msg/schemas/envelope.xsd" ...>
  <SOAP-ENV:Header xmlns:eb="http://oasis-open.org/committees/ebxml-msg/schemas/"
    xsi:schemaLocation=http://www.oasis-open.org/committees/ebxml-msg/schemas/messageHeaderv1_1.xsd
        ...>
    <eb:MessageHeader ...> ...
    </eb:MessageHeader>
  </SOAP-ENV:Header>
  <SOAP-ENV:Body xmlns:eb="http://oasis-open.org/committees/ebxml-msg/schemas/"
    xsi:schemaLocation="http://oasis-open.org/committees/ebxml-msg/schemas/
      http://www.oasis-open.org/committees/ebxml-msg/schemas/messageHeaderv1_1.xsd" ...>
    <eb:Manifest ...> ...
    </eb:Manifest>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

2.2.3 SOAP Header element

The SOAP ***Header*** element is the first child element of the SOAP ***Envelope*** element. It MUST have a namespace qualifier that matches the SOAP ***Envelope*** namespace declaration for the namespace "http://schemas.xmlsoap.org/soap/envelope/".

2.2.4 SOAP Body element

The SOAP ***Body*** element is the second child element of the SOAP ***Envelope*** element. It MUST have a namespace qualifier that matches the SOAP ***Envelope*** namespace declaration for the namespace "http://schemas.xmlsoap.org/soap/envelope/". For example:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" …>
  <SOAP-ENV:Header>…</SOAP-ENV:Header>
  <SOAP-ENV:Body>…</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

2.2.5 ebXML SOAP Extensions

An ebXML Message extends the SOAP *Message* with the following principal extension elements:

- SOAP ***Header*** extensions:
  - ***MessageHeader*** – a REQUIRED element that contains routing information for the message (To/From, etc.) as well as other context information about the message.
- SOAP ***Body*** extensions:
  - ***Manifest*** – an element that points to any data present either in the *Payload Container* or elsewhere, e.g. on the web. This element MAY be omitted.
- Core ebXML Modules:
  - **Error Handling Module**
    - ***ErrorList*** – an element that contains a list of the errors that are being reported against a previous message. The ***ErrorList*** element is only used if reporting an error on a previous message. This element MAY be omitted.
  - **Security Service**
    - ***Signature*** – an element that contains a digital signature that conforms to [XMLDSIG] that signs data associated with the message. This element MAY be omitted.

2.2.6 #wildcard element content

Some ebXML SOAP extension elements allow for foreign namespace-qualified element content to be added to provide for extensibility. The extension element content MUST be namespace-qualified in accordance with [XMLNamespaces] and MUST belong to a foreign namespace. A foreign namespace is one that is NOT http://www.oasis-open.org/committees/ebxml-msg/schema/draft-msg-header-00.xsd .

Any foreign namespace-qualified element added MAY include the SOAP ***mustUnderstand*** attribute. If the SOAP ***mustUnderstand*** attribute is NOT present, the default value implied is '0' (false). If an implementation of the MSH does not recognize the namespace of the element and the value of the SOAP ***mustUnderstand*** attribute is '1' (true), the MSH SHALL report an error (see section 2.2.9) with ***errorCode*** set to ***NotSupported*** and ***severity*** set to ***error***. If the value of the ***mustUnderstand*** attribute is '0' (false) or if the ***mustUnderstand*** attribute is not present, then an implementation of the MSH MAY ignore the namespace-qualified element and its content.

2.2.7 id attributes

Each of the ebXML SOAP extension elements listed above has an optional ***id*** attribute which is an XML ID that MAY be added to provide for the ability to uniquely identify the element within the SOAP *Message*. This MAY be used when applying a digital signature to the ebXML SOAP *Message* as individual ebXML SOAP extension elements can be targeted for inclusion or exclusion by specifying a URI of "#<idvalue>" in the ***Reference*** element.

2.2.8 version attribute

Each ebXML SOAP extension element has its own REQUIRED ***version*** attribute, with a value that matches the ebXML Message Service Specification version level, to allow for elements to change in semantic meaning individually without changing the entire specification.

Use of multiple versions of ebXML SOAP extensions elements within the same ebXML SOAP document, while supported, should only be used in extreme cases where it becomes necessary to semantically change an element, which cannot wait for the next ebXML Message Service Specification version release.

The REQUIRED ***version*** attribute indicates the version of the ebXML Message Service Header Specification to which the ebXML *SOAP* ***Header*** extensions conform. Its purpose is to provide future versioning capabilities. The value of the ***version*** attribute MUST be "1.1". Future versions of this specification SHALL require other values of this attribute. The ***version*** attribute MUST be namespace qualified for the ebXML SOAP ***Envelope*** extensions namespace defined above.

2.2.9 SOAP mustUnderstand attribute

The REQUIRED SOAP ***mustUnderstand*** attribute, namespace qualified to the SOAP namespace (http://schemas.xmlsoap.org/soap/envelope/), indicates that the contents of the ***MessageHeader*** element MUST be understood by a receiving process or else the message MUST be rejected in accordance with [SOAP]. This attribute MUST have a value of '1' (true).

2.2.10 ebXML "Next MSH" actor URI

The URI *http://oasis-open.org/committees/ebxml-msg/nextMSH* when used in the context of the SOAP ***actor*** attribute value SHALL be interpreted to mean an entity that acts in the role of an instance of the ebXML MSH conforming to this specification.

This ***actor*** URI has been established to allow for the possibility that SOAP nodes that are NOT ebXML MSH nodes MAY participate in the message path of an *ebXML Message*. An example might be a SOAP node that digitally signs or encrypts a message.

All ebXML MSH nodes MUST act in this role.

2.2.11 ebXML "To Party MSH" actor URI

The URI *http://oasis-open.org/committees/ebxml-msg/toPartyMSH* when used in the context of the SOAP ***actor*** attribute value SHALL be interpreted to mean an instance of an ebXML MSH node, conforming to this specification, that acts in the role of the Party identified in the ***MessageHeader/To/PartyId*** element of the same message. An ebXML MSH MAY be configured to act in this role. How this is done is outside the scope of this specification.

The MSH that is the ultimate destination of ebXML messages MUST act in the role of the To Party MSH actor URI in addition to acting in the default actor as defined by SOAP.

3 Core Extension Elements

3.1 MessageHeader element

The ***MessageHeader*** element is REQUIRED in all ebXML Messages. It MUST be present as a child element of the SOAP ***Header*** element.

The ***MessageHeader*** element is a composite element comprised of the following subordinate elements:

- ***From***
- ***To***
- ***CPAId***
- ***ConversationId***

- ***Service***
- ***Action***
- ***MessageData***
- ***QualityOfServiceInfo***
- ***Description***

The ***MessageHeader*** element has the following attributes as follows:

- a SOAP ***mustUnderstand*** attribute (See section 2.2.9 for details)
- a ***version*** attribute (See section 2.2.8 for details)
- an ***id*** attribute. See section 2.2.7 for details.

3.1.1 From and To elements

The REQUIRED ***From*** element identifies the *Party* that originated the message. The REQUIRED ***To*** element identifies the *Party* that is the intended recipient of the message. Both ***To*** and ***From*** can contain logical identifiers such as a DUNS number, or identifiers that also imply a physical location such as an eMail address.

The ***From*** and the ***To*** elements each contain:

- ***PartyId*** elements – one or more
- ***Role*** element – zero or one.

If either the ***From*** or ***To*** elements contain multiple ***PartyId*** elements, all members of the list must identify the same organisation. Unless a single ***type*** value refers to multiple identification systems, the value of any given ***type*** attribute MUST be unique within the list of ***PartyId*** elements.contained within either the From or To elements.

Note: This mechanism is particularly useful when transport of a message between the parties may involve multiple intermediaries (see Sections 11.1.3, Multi-hop TraceHeader Sample and 7, ebXML Reliable Messaging Protocol). More generally, the *From Party* should provide identification in all domains it knows in support of intermediaries and destinations that may give preference to particular identification systems.

The ***From*** and ***To*** elements MAY also contain zero or one ***Role*** child element that, if present, SHALL follow the last ***PartyId*** child element.

3.1.1.1 PartyID element

The ***PartyId*** element has a single attribute, ***type*** and content that is a string value. The ***type*** attribute indicates the domain of names to which the string in the content of the ***PartyId*** element belongs. The value of the ***type*** attribute MUST be mutually agreed and understood by each of the *Parties*. It is RECOMMENDED that the value of the ***type*** attribute be a URI. It is further recommended that these values be taken from the EDIRA (ISO 6523), EDIFACT ISO 9735 or ANSI ASC X12 I05 registries.

If the ***PartyId type*** attribute is not present, the content of the ***PartyId*** element MUST be a URI [RFC2396], otherwise the *Receiving MSH* SHOULD report an error (see section 4) with ***errorCode*** set to ***Inconsistent*** and ***severity*** set to ***Error***. It is strongly RECOMMENDED that the content of the ***PartyID*** element be a URI.

3.1.1.2 Role element

The OPTIONAL ***Role*** element identifies the ***authorizedRole*** of the *Party* that is sending (when present as a child of the ***From*** element) and/or receiving (when present as a child of the ***To*** element) the message. The value of the ***Role*** element is a non-empty string, which is specified in the *CPA*.

Note: Role is better defined as a URI – e.g. http://rosettanet.org/roles/buyer.

The following fragment demonstrates usage of the ***From*** and ***To*** elements.

```
<eb:From>
  <eb:PartyId eb:type="urn:duns">123456789</eb:PartyId>
```

```
      <eb:PartyId eb:type="SCAC">RDWY</PartyId>
      <eb:Role>Buyer</eb:Role>
    </eb:From>
    <eb:To>
      <eb:PartyId>mailto:joe@example.com</eb:PartyId>
      <eb:Role>Seller</eb:Role>
    </eb:To>
```

3.1.2 CPAId element

The REQUIRED ***CPAId*** element is a string that identifies the parameters governing the exchange of messages between the parties. The recipient of a message MUST be able to resolve the ***CPAId*** to an individual set of parameters, taking into account the sender of the message.

The value of a ***CPAId*** element MUST be unique within a namespace that is mutually agreed by the two parties. This could be a concatenation of the ***From*** and ***To PartyId*** values, a URI that is prefixed with the Internet domain name of one of the parties, or a namespace offered and managed by some other naming or registry service. It is RECOMMENDED that the ***CPAId*** be a URI.

The ***CPAId*** MAY reference an instance of a *CPA* as defined in the ebXML Collaboration Protocol Profile and Agreement Specification [ebCPP]. An example of the ***CPAId*** element follows:

```
    <eb:CPAId>http://example.com/cpas/ourcpawithyou.xml</eb:CPAId>
```

If the parties are operating under a *CPA*, then the reliable messaging parameters are determined by the appropriate elements from that *CPA*, as identified by the ***CPAId*** element.

If a receiver determines that a message is in conflict with the *CPA*, the appropriate handling of this conflict is undefined by this specification. Therefore, senders SHOULD NOT generate such messages unless they have prior knowledge of the receiver's capability to deal with this conflict.

If a receiver chooses to generate an error as a result of a detected inconsistency, then it MUST report it with an ***errorCode*** of ***Inconsistent*** and a ***severity*** of ***Error***. If it chooses to generate an error because the ***CPAId*** is not recognized, then it MUST report it with an ***errorCode*** of ***NotRecognized*** and a ***severity*** of ***Error***.

3.1.3 ConversationId element

The REQUIRED ***ConversationId*** element is a string identifying the set of related messages that make up a conversation between two *Parties*. It MUST be unique within the ***From*** and ***To*** party pair. The *Party* initiating a conversation determines the value of the ***ConversationId*** element that SHALL be reflected in all messages pertaining to that conversation.

The ***ConversationId*** enables the recipient of a message to identify the instance of an application or process that generated or handled earlier messages within a conversation. It remains constant for all messages within a conversation.

The value used for a ***ConversationId*** is implementation dependent. An example of the ***ConversationId*** element follows:

```
    <eb:ConversationId>20001209-133003-28572</eb:ConversationId>
```

Note: Implementations are free to choose how they will identify and store conversational state related to a specific conversation. Implementations SHOULD provide a facility for mapping between their identification schema and a ***ConversationId*** generated by another implementation.

3.1.4 Service element

The REQUIRED ***Service*** element identifies the *service* that acts on the message and it is specified by the designer of the *service*. The designer of the *service* may be:

- a standards organization, or
- an individual or enterprise

Note: In the context of an ebXML business process model, an *action* equates to the lowest possible role based activity in the [ebBPSS] (requesting or responding role) and a *service* is a set of related actions for an authorized role within a party.

An example of the ***Service*** element follows:

```
<eb:Service>urn:services:SupplierOrderProcessing</eb:Service>
```

Note: URIs in the ***Service*** element that start with the namespace: ***uri:www.oasis-open.org/messageService/*** are reserved for use by this specification.

The ***Service*** element has a single ***type*** attribute.

3.1.4.1 type attribute

If the ***type*** attribute is present, it indicates the parties sending and receiving the message know, by some other means, how to interpret the content of the ***Service*** element. The two parties MAY use the value of the ***type*** attribute to assist in the interpretation.

If the ***type*** attribute is not present, the content of the ***Service*** element MUST be a URI [RFC2396]. If it is not a URI then report an error with ***errorCode*** of ***Inconsistent*** and ***severity*** of ***Error*** (see section 4).

3.1.5 Action element

The REQUIRED ***Action*** element identifies a process within a ***Service*** that processes the Message. ***Action*** SHALL be unique within the ***Service*** in which it is defined. An example of the ***Action*** element follows:

```
<eb:Action>NewOrder</eb:Action>
```

3.1.6 MessageData element

The REQUIRED ***MessageData*** element provides a means of uniquely identifying an ebXML Message. It contains the following four subordinate elements and attributes:

- ***MessageId* element**
- ***Timestamp* element**
- ***RefToMessageId* element**
- ***TimeToLive* element**

The following fragment demonstrates the structure of the ***MessageData*** element:

```
<eb:MessageData>
  <eb:MessageId>20001209-133003-28572@example.com</eb:MessageId>
  <eb:Timestamp>2001-02-15T11:12:12</eb:Timestamp>
  <eb:RefToMessageId>20001209-133003-28571@example.com</eb:RefToMessageId>
</eb:MessageData>
```

3.1.6.1 MessageId element

The REQUIRED element ***MessageId*** is a unique identifier for each message conforming to [RFC2392]. The "local part" of the identifier as defined in [RFC2392] is implementation dependent.

3.1.6.2 Timestamp element

The REQUIRED ***Timestamp*** is a value representing the time that the message header was created conforming to an [XMLSchema] dateTime and MUST be expressed as UTC. Indicating UTC in the ***Timestamp*** element by including the 'Z' identifier is optional.

3.1.6.3 RefToMessageId element

The ***RefToMessageId*** element has a cardinality of zero or one. When present, it MUST contain the ***MessageId*** value of an earlier ebXML Message to which this message relates. If there is no earlier related message, the element MUST NOT be present.

For Error messages, the ***RefToMessageId*** element is REQUIRED and its value MUST be the ***MessageId*** value of the message in error (as defined in section 4).

3.1.6.4 TimeToLive element

The ***TimeToLive*** element indicates the time by which a message should be delivered to and processed by the *To Party*. The ***TimeToLive*** element is discussed under Reliable Messaging in section 11.1.

3.1.7 QualityOfServiceInfo element

The ***QualityOfServiceInfo*** element identifies the quality of service with which the message is delivered. This element contains:

- a ***syncReply*** attribute
- a ***duplicateElimination*** attribute

The ***QualityOfServiceInfo*** element SHALL be present if any of the attributes within the element need to be set to their non-default value. The ***duplicateElimination*** attribute set to ***true*** requires the receiving MSH to have a persistent store implemented (see section 7.4.1 for more details).

3.1.7.1 syncReply attribute

The OPTIONAL ***syncReply*** attribute is used only if the data communication protocol is *synchronous* (e.g. HTTP). It is an [XMLSchema] boolean. If the communication protocol is not *synchronous*, then the value of ***syncReply*** is ignored. If the ***syncReply*** attribute is not present, it is semantically equivalent to its presence with a value of ***false***. If the ***syncReply*** attribute is present with a value of ***true,*** the MSH must return the response from the application or business process in the payload of the *synchronous* reply message. See also the description of ***syncReply*** in the [ebCPP] specification. If there is a CPA, the value of ***syncReply*** MUST be ***true*** if the value of ***syncReplyMode*** in the CPA is not ***None***.

3.1.7.2 duplicateElimination attribute

Valid values for ***duplicateElimination*** are:

- ***true*** – this results in a delivery behavior of Only-Once.
- ***false*** – this results in a delivery behavior of Best-Effort.

The default value of ***duplicateElimination*** is ***false***. See section 7.4.1 for more details. Combining ***duplicateElimination*** set to ***True*** with ***Retries*** and ***Acknowledgments*** can result in a delivery behavior of Once-and-Only-Once.

3.1.8 Description element

The ***Description*** element MAY be present zero or more times as a child element of ***MessageHeade***r. Its purpose is to provide a human readable description of the purpose or intent of the message. The language of the description is defined by a required ***xml:lang*** attribute. The ***xml:lang*** attribute MUST comply with the rules for identifying languages specified in [XML]. Each occurrence SHOULD have a different value for ***xml:lang***.

3.1.9 MessageHeader Sample

The following fragment demonstrates the structure of the ***MessageHeader*** element within the SOAP ***Header***:

```
<eb:MessageHeader id="…" eb:version="1.1" SOAP-ENV:mustUnderstand="1">
  <eb:From><eb:PartyId>uri:example.com</eb:PartyId></eb:From>
  <eb:To>
     <eb:PartyId eb:type="someType">QRS543</eb:PartyId>
```

```
      <eb:Role>Seller</eb:Role>
  </eb:To>
  <eb:CPAId>http://www.oasis-open.org/cpa/123456</eb:CPAId>
  <eb:ConversationId>987654321</eb:ConversationId>
  <eb:Service eb:type="myservicetypes">QuoteToCollect</eb:Service>
  <eb:Action>NewPurchaseOrder</eb:Action>
  <eb:MessageData>
    <eb:MessageId>mid:UUID-2</eb:MessageId>
    <eb:Timestamp>2000-07-25T12:19:05</eb:Timestamp>
    <eb:RefToMessageId>mid:UUID-1</eb:RefToMessageId>
  <eb:QualityOfServiceInfo syncReply="true" duplicateElimination="true"/>
  </eb:MessageData>
</eb:MessageHeader>
```

3.2 Manifest element

The ***Manifest*** element MAY be present as a child of the SOAP ***Body*** element. The ***Manifest*** element is a composite element consisting of one or more ***Reference*** elements. Each ***Reference*** element identifies data associated with the message, whether included as part of the message as payload document(s) contained in a *Payload Container*, or remote resources accessible via a URL. It is RECOMMENDED that no payload data be present in the SOAP ***Body***. The purpose of the ***Manifest*** is as follows:

- to make it easier to directly extract a particular payload associated with this ebXML Message,
- to allow an application to determine whether it can process the payload without having to parse it.

The ***Manifest*** element is comprised of the following attributes and elements, each of which is described below:

- an ***id*** attribute (See section 2.2.7 for details)
- a ***version*** attribute (See section 2.2.8 for details)
- one or more ***Reference*** elements
- ***#wildcard*** (See section 2.2.6 for details).

3.2.1 Reference element

The ***Reference*** element is a composite element consisting of the following subordinate elements:

- ***Schema*** - information about the schema(s) that define the instance document identified in the parent ***Reference*** element
- ***Description*** - a textual description of the payload object referenced by the parent ***Reference*** element
- ***#wildcard*** - any namespace-qualified element content belonging to a foreign namespace. (See section 2.2.6 for details).

The ***Reference*** element itself is an [XLINK] simple link. XLINK is presently a Candidate Recommendation (CR) of the W3C. It should be noted that the use of XLINK in this context is chosen solely for the purpose of providing a concise vocabulary for describing an association. Use of an XLINK processor or engine is NOT REQUIRED, but MAY prove useful in certain implementations.

The ***Reference*** element has the following attribute content in addition to the element content described above:

- ***id*** - an XML ID for the ***Reference*** element,
- ***xlink:type*** - this attribute defines the element as being an XLINK simple link. It has a fixed value of 'simple',
- ***xlink:href*** - this REQUIRED attribute has a value that is the URI of the payload object referenced. It SHALL conform to the [XLINK] specification criteria for a simple link.
- ***xlink:role*** - this attribute identifies some resource that describes the payload object or its purpose. If present, then it SHALL have a value that is a valid URI in accordance with the [XLINK] specification,
- Any other namespace-qualified attribute MAY be present. A *Receiving MSH* MAY choose to ignore any foreign namespace attributes other than those defined above.

3.2.1.1 Schema element

If the item being referenced has schema(s) of some kind that describe it (e.g. an XML Schema, DTD, or a database schema), then the ***Schema*** element SHOULD be present as a child of the ***Reference*** element. It provides a means of identifying the schema and its version defining the payload object identified by the parent ***Reference*** element. The ***Schema*** element contains the following attributes:

- ***location*** - the REQUIRED URI of the schema
- ***version*** – a version identifier of the schema

3.2.1.2 Description element

The ***Reference*** element MAY contain zero or more ***Description*** elements. The ***Description*** is a textual description of the payload object referenced by the parent ***Reference*** element. The language of the description is defined by a REQUIRED ***xml:lang*** attribute. The ***xml:lang*** attribute MUST comply with the rules for identifying languages specified in [XML]. This element is provided to allow a human readable description of the payload object identified by the parent ***Reference*** element. If multiple ***Description*** elements are present, each SHOULD have a unique ***xml:lang*** attribute value. An example of a ***Description*** element follows.

```
<eb:Description xml:lang="en-gb">Purchase Order for 100,000 widgets</eb:Description>
```

3.2.2 References included in a Manifest

The designer of the business process or information exchange that is using ebXML Messaging decides what payload data is referenced by the ***Manifest*** and the values to be used for ***xlink:role***.

3.2.3 Manifest Validation

If an ***xlink:href*** attribute contains a URI that is a content id (URI scheme "`cid`") then a MIME part with that `content-id` MUST be present in the *Payload Container* of the message. If it is not, then the error SHALL be reported to the *From Party* with an ***errorCode*** of ***MimeProblem*** and a ***severity*** of ***Error***.

If an ***xlink:href*** attribute contains a URI that is not a content id (URI scheme "`cid`"), and that URI cannot be resolved, then it is an implementation decision on whether to report the error. If the error is to be reported, then it SHALL be reported to the *From Party* with an ***errorCode*** of ***MimeProblem*** and a ***severity*** of ***Error***.

3.2.4 Manifest Sample

The following fragment demonstrates a typical ***Manifest*** for a message with a single payload MIME body part:

```
<eb:Manifest eb:id="Manifest" eb:version="1.1">
  <eb:Reference eb:id="pay01"
    xlink:href="cid:payload-1"
    xlink:role="http://regrep.org/gci/purchaseOrder">
    <eb:Schema eb:location="http://regrep.org/gci/purchaseOrder/po.xsd" eb:version="1.1"/>
    <eb:Description xml:lang="en-us">Purchase Order for 100,000 widgets</eb:Description>
  </eb:Reference>
</eb:Manifest>
```

4 Core Modules

4.1 Security Module

The *ebXML Message Service*, by its very nature, presents certain security risks. A Message Service may be at risk by means of:

- Unauthorized access
- Data integrity and/or confidentiality attacks (e.g. through man-in-the-middle attacks)

- Denial-of-Service and spoofing

Each security risk is described in detail in the ebXML Technical Architecture Risk Assessment Technical Report[secRISK].

Each of these security risks MAY be addressed in whole, or in part, by the application of one, or a combination, of the countermeasures described in this section. This specification describes a set of profiles, or combinations of selected countermeasures, selected to address key risks based upon commonly available technologies. Each of the specified profiles includes a description of the risks that are not addressed.

Application of countermeasures SHOULD be balanced against an assessment of the inherent risks and the value of the asset(s) that might be placed at risk. See Appendix C for a table of security profiles.

4.1.1 Signature element

An ebXML Message MAY be digitally signed to provide security countermeasures. Zero or more ***ds:Signature*** elements, belonging to the [XMLDSIG] defined namespace, MAY be present as a child of the SOAP ***Header***. The ***ds:Signature*** element MUST be namespace qualified in accordance with [XMLDSIG]. The structure and content of the ***ds:Signature*** element MUST conform to the [XMLDSIG] specification. If there is more than one ***ds:Signature*** element contained within the SOAP ***Header***, the first MUST represent the digital signature of the ebXML Message as signed by the *From Party* MSH in conformance with section 4. Additional ***ds:Signature*** elements MAY be present, but their purpose is undefined by this specification.

Refer to section 4 for a detailed discussion on how to construct the ***ds:Signature*** element when digitally signing an ebXML Message.

4.1.2 Security and Management

No technology, regardless of how advanced it might be, is an adequate substitute to the effective application of security management policies and practices.

It is strongly RECOMMENDED that the site manager of an *ebXML Message Service* apply due diligence to the support and maintenance of its; security mechanism, site (or physical) security procedures, cryptographic protocols, update implementations and apply fixes as appropriate. (See http://www.cert.org/ and http://ciac.llnl.gov/)

4.1.2.1 Collaboration Protocol Agreement

The configuration of Security for MSHs may be specified in the *CPA*. Two areas of the *CPA* have security definitions as follows:

- The Document Exchange section addresses security to be applied to the payload of the message. The MSH is not responsible for any security specified at this level but may offer these services to the message sender.
- The Transport section addresses security applied to the entire ebXML Document, which includes the header and the payload.

4.1.3 Signature Generation

1) Create a ***ds:SignedInfo*** element with ***ds:SignatureMethod***, ***ds:CanonicalizationMethod***, and ***ds:Reference*** elements for the SOAP ***Header*** and any required payload objects, as prescribed by [XMLDSIG].
2) Canonicalize and then calculate the ***ds:SignatureValue*** over ***ds:SignedInfo*** based on algorithms specified in ***ds:SignedInfo*** as specified in [XMLDSIG].
3) Construct the ***ds:Signature*** element that includes the ***ds:SignedInfo***, ***ds:KeyInfo*** (RECOMMENDED), and ***ds:SignatureValue*** elements as specified in [XMLDSIG].
4) Include the namespace qualified ***ds:Signature*** element in the SOAP ***Header*** just signed.

The ***ds:SignedInfo*** element SHALL be composed of zero or one ***ds:CanonicalizationMethod*** element, the ***ds:SignatureMethod*** and one or more ***ds:Reference*** elements.

The ***ds:CanonicalizationMethod*** element is defined as OPTIONAL in [XMLDSIG], meaning that the element need not appear in an instance of a ***ds:SignedInfo*** element. The default canonicalization method that is applied to the data to be signed is [XMLC14N] in the absence of a ***ds:Canonicalization*** element that specifies otherwise. This default SHALL also serve as the default canonicalization method for the *ebXML Message Service*.

The ***ds:SignatureMethod*** element SHALL be present and SHALL have an Algorithm attribute. The RECOMMENDED value for the Algorithm attribute is:

http://www.w3.org/2000/09/xmldsig#dsa-sha1

This RECOMMENDED value SHALL be supported by all compliant *ebXML Message Service* software implementations.

The ***ds:Reference*** element for the SOAP ***Header*** document SHALL have a URI attribute value of "" to provide for the signature to be applied to the document that contains the ***ds:Signature*** element (the SOAP ***Header***).

The ***ds:Reference*** element for the SOAP ***Header*** MAY include a ***Type*** attribute that has a value "http://www.w3.org/2000/09/xmldsig#Object" in accordance with [XMLDSIG]. This attribute is purely informative. It MAY be omitted. Implementations of the ebXML MSH SHALL be prepared to handle either case. The ***ds:Reference*** element MAY include the optional ***id*** attribute.

The ***ds:Reference*** element for the SOAP ***Header*** SHALL include a child ***ds:Transforms*** element. The ***ds:Transforms*** element SHALL include a ***ds:Transform*** child element. The ***ds:Transform*** element SHALL have a ***ds:Algorithm*** attribute that has a value of:

http://www.w3.org/2000/09/xmldsig#enveloped-signature

NOTE: Another transform needs to be added which excludes all elements with actor=next or actor=nextMSH

The result of the [XPath] statement excludes the ***ds:Signature*** element within which it is contained, and all its descendants.

Each payload object that requires signing SHALL be represented by a ***ds:Reference*** element that SHALL have a ***URI*** attribute that resolves to that payload object. This MAY be either the `Content-Id` URI of the MIME body part of the payload object, or a URI that matches the Content-Location of the MIME body part of the payload object, or a URI that resolves to an external payload object external to the Message Package. It is strongly RECOMMENDED that the URI attribute value match the xlink:href URI value of the corresponding ***Manifest/Reference*** element for that payload object. However, this is NOT REQUIRED.

Example of digitally signed ebXML SOAP *Message*:

```
<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:xlink="http://www.w3.org/1999/xlink"
      xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
      xmlns:eb="http://oasis-open.org/committees/ebxml-msg/schemas/">
  <SOAP-ENV:Header>
    <eb:MessageHeader eb:id="..." eb:version="1.1">
    ...
    </eb:MessageHeader>
    <ds:Signature xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
      <ds:SignedInfo>
        <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2000/CR-xml-c14n-20001026"/>
        <ds:SignatureMethod Algorithm="http://www.w3.org/2000/09/xmldsig#dsa-sha1"/>
        <ds:Reference URI="">
          <ds:Transforms>
              <ds:Transform Algorithm=http://www.w3.org/2000/09/xmldsig#enveloped-signature/>
          </ds:Transforms>
          <ds:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
          <ds:DigestValue>...</ds:DigestValue>
        </ds:Reference>
        <ds:Reference URI="cid://blahblahblah/">
          <ds:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsigsha1"/>
          <ds:DigestValue>...</ds:DigestValue>
        </ds:Reference>
      </ds:SignedInfo>
      <ds:SignatureValue>...</ds:SignatureValue>
      <ds:KeyInfo>...</ds:KeyInfo>
    </ds:Signature>
  </SOAP-ENV:Header>
  <SOAP-ENV:Body>
    <eb:Manifest eb:id="Mani01" eb:version="1.1">
      <eb:Reference xlink:href="cid://blahblahblah"
        xlink:role="http://ebxml.org/gci/invoice">
        <eb:Schema eb:version="1.1" eb:location="http://ebxml.org/gci/busdocs/invoice.dtd"/>
      </eb:Reference>
    </eb:Manifest>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

4.1.4 Countermeasure Technologies

4.1.4.1 Persistent Digital Signature

If signatures are being used to digitally sign an ebXML Message then XML Signature [DSIG] MUST be used to bind the ebXML SOAP ***Header*** and ***Body*** to the ebXML Payload Container or data elsewhere on the web that relates to the message. It is also strongly RECOMMENDED that XML Signature be used to digitally sign the Payload on its own.

The only available technology that can be applied to the purpose of digitally signing an ebXML Message (the ebXML SOAP ***Header*** and ***Body*** and its associated payload objects) is provided by technology that conforms to the W3C/IETF joint XML Signature specification [XMLDSIG]. An XML Signature conforming to this specification can selectively sign portions of an XML document(s), permitting the documents to be augmented (new element content added) while preserving the validity of the signature(s).

An ebXML Message requiring a digital signature SHALL be signed following the process defined in this section of the specification and SHALL be in full compliance with [XMLDSIG].

4.1.4.2 Persistent Signed Receipt

An *ebXML Message* that has been digitally signed MAY be acknowledged with a ***DeliveryReceipt*** *Acknowledgment Message* that itself is digitally signed in the manner described in the previous section. The *Acknowledgment Message* MUST contain a ***ds:Reference*** element consistent with that contained in the ***ds:Signature*** element of the original message.

4.1.4.3 Non-persistent Authentication

Non-persistent authentication is provided by the communications channel used to transport the *ebXML Message*. This authentication MAY be either in one direction, from the session initiator to the receiver, or bi-directional. The specific method will be determined by the communications protocol used. For instance, the use of a secure network protocol, such as [RFC2246] or [IPSEC] provides the sender of an *ebXML Message* with a way to authenticate the destination for the TCP/IP environment.

4.1.4.4 Non-persistent Integrity

Use of a secure network protocol such as [RFC2246] or [IPSEC] MAY be configured to provide for integrity check CRCs of the packets transmitted via the network connection.

4.1.4.5 Persistent Confidentiality

XML Encryption is a W3C/IETF joint activity that is actively engaged in the drafting of a specification for the selective encryption of an XML document(s). It is anticipated that this specification will be completed within the next year. The ebXML Transport, Routing and Packaging team has identified this technology as the only viable means of providing persistent, selective confidentiality of elements within an *ebXML Message* including the SOAP ***Header***.

Confidentiality for ebXML Payload Containers MAY be provided by functionality possessed by a MSH. Payload confidentiality MAY be provided by using XML Encryption (when available) or some other cryptographic process (such as [S/MIME], [S/MIMEV3], or [PGP/MIME]) bilaterally agreed upon by the parties involved. Since XML Encryption is not currently available, it is RECOMMENDED that [S/MIME] encryption methods be used for ebXML Payload Containers. The XML Encryption standard SHALL be the default encryption method when XML Encryption has achieved W3C Recommendation status.

4.1.4.6 Non-persistent Confidentiality

Use of a secure network protocol such as [RFC2246] or [IPSEC] provides transient confidentiality of a message as it is transferred between two ebXML MSH nodes.

4.1.4.7 Persistent Authorization

The OASIS Security Services Technical Committee (TC) is actively engaged in the definition of a specification that provides for the exchange of security credentials, including NameAssertion and Entitlements that is based on [SAML]. Use of technology that is based on this anticipated specification MAY be used to provide persistent authorization for an *ebXML Message* once it becomes available. ebXML has a formal liaison to this TC. There are also many ebXML member organizations and contributors that are active members of the OASIS Security Services TC that are endeavoring to ensure that the specification meets the requirements of providing persistent authorization capabilities for the *ebXML Message Service*.

4.1.4.8 Non-persistent Authorization

Use of a secure network protocol such as [RFC2246] or [IPSEC] MAY be configured to provide for bilateral authentication of certificates prior to establishing a session. This provides for the ability for an ebXML MSH to authenticate the source of a connection that can be used to recognize the source as an authorized source of *ebXML Messages*.

4.1.4.9 Trusted Timestamp

At the time of this specification, services that offer trusted timestamp capabilities are becoming available. Once these become more widely available, and a standard has been defined for their use and expression, these standards, technologies and services will be evaluated and considered for use to provide this capability.

4.2 Error Handling Module

This section describes how one ebXML Message Service Handler (MSH) reports errors it detects in an ebXML Message to another MSH. The *ebXML Message Service* error reporting and handling is to be considered as a layer of processing above the SOAP processor layer. This means the ebXML MSH is essentially an application-level handler of a *SOAP Message* from the perspective of the SOAP Processor. The SOAP processor MAY generate SOAP ***Fault*** messages if it is unable to process the message. A *Sending MSH* MUST be prepared to accept and process these SOAP ***Faults***.

It is possible for the ebXML MSH software to cause a SOAP fault to be generated and returned to the sender of a SOAP *Message*. In this event, the returned message MUST conform to the [SOAP] specification processing guidelines for SOAP ***Faults***.

An ebXML *SOAP Message* that reports an error that has a ***highestSeverity*** of ***Warning*** SHALL NOT be reported or returned as a SOAP ***Fault***.

4.2.1.1 Definitions

For clarity, two phrases are defined that are used in this section:

- *"*message in error" - A *message* that contains or causes an error of some kind
- "message reporting the error" - A *message* that contains an ebXML ***ErrorList*** element that describes the error(s) found in a message in error.

4.2.1.2 Types of Errors

One MSH needs to report to another MSH errors in a message in error. For example, errors associated with:

- ebXML namespace qualified content of the *SOAP Message* document (see section 2.2.1)
- reliable messaging failures (see section 11.1)
- security (see section 4)

Unless specified to the contrary, all references to "an error" in the remainder of this specification imply any or all of the types of errors listed above.

Errors associated with Data Communication protocols are detected and reported using the standard mechanisms supported by that data communication protocol and do not use the error reporting mechanism described here.

4.2.2 ErrorList element

The existence of an ***ErrorList*** element within the SOAP ***Header*** element indicates that the message that is identified by the ***RefToMessageId*** in the ***MessageHeader*** element has an error.

The ***ErrorList*** element consists of one or more ***Error*** elements and the following attributes:

- ***id*** attribute
- a SOAP ***mustUnderstand*** attribute (See section 2.2.9 for details)
- a ***version*** attribute (See section 2.2.8 for details)
- ***highestSeverity*** attribute

If there are no errors to be reported then the ***ErrorList*** element MUST NOT be present.

4.2.2.1 id attribute

The ***id*** attribute uniquely identifies the ***ErrorList*** element within the document (See section 2.2.7).

4.2.2.2 highestSeverity attribute

The ***highestSeverity*** attribute contains the highest severity of any of the ***Error*** elements. Specifically, if any of the ***Error*** elements have a ***severity*** of ***Error*** then ***highestSeverity*** must be set to ***Error***, otherwise set ***highestSeverity*** to ***Warning***.

4.2.2.2.1 Error element

An ***Error*** element consists of the following attributes:

- ***codeContext***
- ***errorCode***
- ***severity***
- ***location***
- ***xml:lang***
- ***id*** (See section 2.2.7 for details)

The content of the ***Error*** element contains an error message.

4.2.2.2.2 codeContext attribute

The REQUIRED ***codeContext*** attribute identifies the namespace or scheme for the ***errorCodes***. It MUST be a URI. Its default value is ***http://www.oasis-open.org/messageServiceErrors***. If it does not have the default value, then it indicates that an implementation of this specification has used its own ***errorCodes***.

Use of non-ebXML values for ***errorCodes*** is NOT RECOMMENDED. In addition, an implementation of this specification MUST NOT use its own ***errorCodes*** if an existing ***errorCode*** as defined in this section has the same or very similar meaning.

4.2.2.2.3 errorCode attribute

The REQUIRED ***errorCode*** attribute indicates the nature of the error in the message in error. Valid values for the ***errorCode*** and a description of the code's meaning are given in sections.

4.2.2.2.4 severity attribute

The REQUIRED ***severity*** attribute indicates the severity of the error. Valid values are:

- ***Warning*** - This indicates that although there is an error, other messages in the conversation will still be generated in the normal way.
- ***Error*** - This indicates that there is an unrecoverable error in the message and no further messages will be generated as part of the conversation.

4.2.2.2.5 location attribute

The ***location*** attribute points to the part of the message that is in error.

If an error exists in an ebXML element and the element is "well formed" (see [XML]), then the content of the ***location*** attribute MUST be an [XPointer].

If the error is associated with the MIME envelope that wraps the SOAP envelope and the ebXML Payload Container, then ***location*** contains the `content-id` of the MIME part that is in error, in the format `cid:23912480wsr`, where the text after the":" is the value of the MIME part's `content-id`.

4.2.2.2.6 Error element Content

The content of the error message provides a narrative description of the error in the language defined by the ***xml:lang*** attribute. Typically, it will be the message generated by the XML parser or other software that is validating the message. This means that the content is defined by the vendor/developer of the software that generated the ***Error*** element.

The ***xml:lang*** attribute must comply with the rules for identifying languages specified in [XML].

The content of the ***Error*** element can be empty.

4.2.2.3 ErrorList Sample

An example of an ***ErrorList*** element is given below.

```
<eb:ErrorList eb:id='3490sdo9', eb:highestSeverity="error" eb:version="1.1"
          SOAP-ENV:mustUnderstand="1">
  <eb:Error eb:errorCode='SecurityFailure' eb:severity="Error"
     eb:location='URI_of_ds:Signature_goes_here' xml:lang="us-en">
     Validation of signature failed </eb:Error>
  <eb:Error ...> ... </eb:Error>
</eb:ErrorList>
```

4.2.2.4 errorCode values

This section describes the values for the ***errorCode*** element used in a *message reporting an erro*r. They are described in a table with three headings:

- the first column contains the value to be used as an ***errorCode***, e.g. ***SecurityFailure***
- the second column contains a "Short Description" of the ***errorCode***.
  Note: this narrative MUST NOT be used in the content of the ***Error*** element.
- the third column contains a "Long Description" that provides an explanation of the meaning of the error and provides guidance on when the particular ***errorCode*** should be used.

4.2.2.4.1 Reporting Errors in the ebXML Elements

The following list contains error codes that can be associated with ebXML elements:

Error Code	Short Description	Long Description
ValueNotRecognized	Element content or attribute value not recognized.	Although the document is well formed and valid, the element/attribute contains a value that could not be recognized and therefore could not be used by the *ebXML Message Service*.
NotSupported	Element or attribute not supported	Although the document is well formed and valid, an element or attribute is present that is consistent with the rules and constraints contained in this specification, but is not supported by the *ebXML Message Service* processing the message.
Inconsistent	Element content or attribute value inconsistent with other elements or attributes.	Although the document is well formed and valid, according to the rules and constraints contained in this specification the content of an element or attribute is inconsistent with the content of other elements or their attributes.
OtherXml	Other error in an element content or attribute value.	Although the document is well formed and valid, the element content or attribute value contains values that do not conform to the rules and constraints contained in this specification and is not covered by other error codes. The content of the ***Error*** element should be used to indicate the nature of the problem.

4.2.2.4.2 Non-XML Document Errors

The following are error codes that identify errors not associated with the ebXML elements:

Error Code	Short Description	Long Description
DeliveryFailure	Message Delivery Failure	A message has been received that either probably or definitely could not be sent to its next destination. Note: if ***severity*** is set to ***Warning*** then there is a small probability that the message was delivered.
TimeToLiveExpired	Message Time To Live Expired	A message has been received that arrived after the time specified in the ***TimeToLive*** element of the ***MessageHeader*** element
SecurityFailure	Message Security Checks Failed	Validation of signatures or checks on the authenticity or authority of the sender of the message have failed.
Unknown	Unknown Error	Indicates that an error has occurred that is not covered explicitly by any of the other errors. The content of the ***Error*** element should be used to indicate the nature of the problem.

4.2.3 Implementing Error Reporting and Handling

4.2.3.1 When to Generate Error Messages

When a MSH detects an error in a message it is strongly RECOMMENDED that the error is reported to the MSH that sent the message that had an error if:

- the Error Reporting Location (see section 4) to which the message reporting the error should be sent can be determined, and
- the message in error does not have an ***ErrorList*** element with ***highestSeverity*** set to ***Error***.

If the Error Reporting Location cannot be found or the message in error has an ***ErrorList*** element with ***highestSeverity*** set to ***Error***, it is RECOMMENDED that:

- the error is logged, and
- the problem is resolved by other means, and
- no further action is taken.

4.2.3.1.1 Security Considerations

Parties that receive a Message containing an error in the header SHOULD always respond to the message. However, they MAY ignore the message and not respond if they consider that the message received is unauthorized or is part of some security attack. The decision process resulting in this course of action is implementation dependent.

4.2.3.2 Identifying the Error Reporting Location

The Error Reporting Location is a URI that is specified by the sender of the message in error that indicates where to send a *message reporting the erro*r.

The ***ErrorURI*** implied by the *CPA*, identified by the ***CPAId*** on the message, SHOULD be used. Otherwise, the recipient MAY resolve an ***ErrorURI*** using the ***From*** element of the message in error. If this is not possible, no error will be reported to the sending *Party*.

Even if the message in error cannot be successfully analyzed or parsed, MSH implementers SHOULD try to determine the Error Reporting Location by other means. How this is done is an implementation decision.

4.2.3.3 Service and Action Element Values

An ***ErrorList*** element can be included in a SOAP ***Header*** that is part of a *message* being sent as a result of processing of an earlier message. In this case, the values for the ***Service*** and ***Action*** elements are set by the designer of the Service.

An ***ErrorList*** element can also be included in an SOAP ***Header*** that is not being sent as a result of the processing of an earlier message. In this case, if the ***highestSeverity*** is set to ***Error***, the values of the ***Service*** and ***Action*** elements MUST be set as follows:

- *The **Service** element MUST be set to:* **uri:www.oasis-open.org/messageService/**
- The ***Action*** element MUST be set to ***MessageError***.

If the ***highestSeverity*** is set to ***Warning***, the ***Service*** and ***Action*** elements MUST NOT be used.

5 Combining ebXML SOAP Extension Elements

This section describes how the various ebXML SOAP extension elements may be used in combination.

5.1.1 MessageHeader element

The ***MessageHeader*** element MUST be present in every message.

5.1.2 Manifest element

The ***Manifest*** element MUST be present if there is any data associated with the message that is not present in the *Header Container*. This applies specifically to data in the *Payload Container* or elsewhere, e.g. on the web.

5.1.3 Signature element

One or more ***ds:Signature*** elements MAY be present on any message.

5.1.4 ErrorList element

If the ***highestSeverity*** attribute on the ***ErrorList*** is set to ***Warning***, then this element MAY be present with any other element except the ***StatusRequest*** element. An ***ErrorList*** element MUST NOT be present with a ***StatusRequest*** element.

If the ***highestSeverity*** attribute on the ***ErrorList*** is set to ***Error***, then this element MUST NOT be present with the following:

- a ***Manifest*** element
- a ***StatusResponse*** element

Part II. Optional Features

6 Delivery Receipts

Delivery Receipts enable the From Party MSH to request a receipt from the To Party MSH indicating that the ebXML message arrived. The Delivery Receipt mechanism MAY also be used to perform End-to-End Reliable Messaging by acting as an *Acknowledgment Message*. The Delivery Receipt mechanism allows the *Acknowledgment Message* to include a digest of the original message which, if signed, acts as Non-Repudiation of Receipt.

6.1 DeliveryReceiptRequested element

The ***DeliveryReceiptRequested*** is an optional extension to the SOAP ***Header*** containing the following:

- A ***signed*** attribute
- a ***version*** attribute (See section 2.2.8 for details)
- an **id** attribute (See section 2.2.7 for details)

6.1.1 DeliveryReceiptRequested Sample

An example of the ***DeliveryReceiptRequested*** element is given below:

```
    <eb:DeliveryReceiptRequested eb:version="1.1" eb:signed="true" />
```

6.1.2 signed attribute

The ***signed*** attribute is used by a *From Party* to indicate whether a message received by the *To Party* MSH should result in the *To Party* returning a signed or unsigned Delivery Receipt.

Valid values for ***signed*** are:

- ***true*** - requests that a signed Delivery Receipt is requested, or
- ***false*** - requests that an unsigned Delivery Receipt is requested

When a *To Party MSH* receives a message with ***signed*** attribute set to ***true*** or ***false*** then it should verify that it is able to support the type of Delivery Receipt requested. The default value of ***signed*** is ***false***.

- If the *To Party MSH* can produce the Delivery Receipt of the type requested, then it MUST return to the *From Party MSH* a message containing a ***DeliveryReceipt*** element.
- If the *To Party MSH* cannot return a Delivery Receipt of the type requested then it MUST report the error to the *From Party MSH* using an ***errorCode*** of ***NotSupported*** and a ***severity*** of ***Warning***.

If there are no errors in the message received and a ***DeliveryReceipt*** is being sent on its own, not as part of message containing payload data, then the ***Service*** and ***Action*** MUST be set as follows:

- the ***Service*** element MUST be set to ***uri:www.oasis-open.org/messageService/***
- the ***Action*** element MUST be set to ***DeliveryReceipt***

6.1.3 DeliveryReceiptRequested Element Interaction

Before setting the values of ***DeliveryReceiptRequested***, the *From Party* SHOULD check if the *To Party* supports Delivery Receipts of the type requested (see also [ebCPP]). A ***DeliveryReceiptRequested*** element MUST NOT be included with a ***DeliveryReceipt*** element or an ***Error*** element.

6.2 DeliveryReceipt element

The ***DeliveryReceipt*** element is an optional extension to the SOAP ***Body*** that is used by the *To Party* that received a message, to let the *From Party* that sent the original message, know that the message was received. The ***RefToMessageId*** in the ***DeliveryReceipt*** element is used to identify the message for which the receipt is being generated by its ***MessageId****.*

The ***DeliveryReceipt*** element consists of the following:

- an **id** attribute (See section 2.2.7)
- a ***version*** attribute (See section 2.2.8 for details)
- a ***Timestamp*** element
- a ***RefToMessageId*** element
- zero or more ***ds:Reference*** element(s)

6.2.1 RefToMessageId element

A REQUIRED ***RefToMessageId*** element that contains the ***MessageId*** of the message whose delivery is being reported.

6.2.2 Timestamp element

The ***Timestamp*** element is a value representing the time that the message for which a ***DeliveryReceipt*** element is being generated was received by the *To Party*. It must conform to an [XMLSchema] dateTime and expressed as UTC (section 3.1.6.2).

6.2.3 ds:Reference element

A ***DeliveryReceipt*** MAY be used to enable non-repudiation of receipt by a MSH by including one or more ***Reference*** elements from the [XMLDSIG] namespace (http://www.w3.org/2000/09/xmldsig#) derived from the message being acknowledged. If the ***DeliveryReceipt*** is signed, the ***ds:Reference*** element(s) corresponding to the original message is REQUIRED. The ***Reference*** element(s) MUST be namespace qualified to the aforementioned namespace and MUST conform to the XML Signature [XMLDSIG] specification.

6.2.4 DeliveryReceipt Sample

An example of the ***DeliveryReceipt*** element is given below:

```
<eb:DeliveryReceipt eb:version="1.1">
  <eb:Timestamp>2001-03-09T12:22:30</eb:Timestamp>
  <eb:RefToMessageId>323210:e52151ec74:-7ffc@xtacy</eb:RefToMessageId>
  <ds:Reference URI="cid://blahblahblah/">
    <ds:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
    <ds:DigestValue>...</ds:DigestValue>
  </ds:Reference>
</eb:DeliveryReceipt>
```

6.2.5 DeliveryReceipt Element Interaction

A ***DeliveryReceipt*** element may be present on any message. A ***DeliveryReceipt*** element MUST NOT be present with a ***DeliveryReceiptRequested*** element or with an ***Error*** element**.**

7 Reliable Messaging Module

Reliable Messaging defines an interoperable protocol such that two Message Service Handlers (MSH) can "reliably" exchange messages that are sent using "reliable messaging" semantics, resulting in the *To Party* receiving the message Once-And-Only-Once. The protocol is flexible, allowing for both store-and-forward and end-to-end reliable messaging.

Reliability is achieved by a *Receiving MSH* responding to a message with an *Acknowledgment Message*. An *Acknowledgment Message* is any ebXML message containing an ***Acknowledgment*** element. Failure to receive an *Acknowledgment Message* by a *Sending MSH* triggers successive retries until such time as an *Acknowledgment Message* is received or the predetermined number of retries has been exceeded at which time a *Delivery Failure Notification* is sent to the *From Party*.

7.1 Persistent Storage and System Failure

A MSH that supports Reliable Messaging MUST keep messages that are sent or received reliably in *persistent storage*. In this context *persistent storage* is a method of storing data that does not lose information after a system failure or interruption.

This specification recognizes that different degrees of resilience may be realized depending upon the technology that is used to store the data. However, at a minimum, persistent storage that has the resilience characteristics of a hard disk (or equivalent) SHOULD be used. It is strongly RECOMMENDED though that implementers of this specification use technology that is resilient to the failure of any single hardware or software component.

After a system interruption or failure, a MSH MUST ensure that messages in persistent storage are processed in the same way as if the system failure or interruption had not occurred. How this is done is an implementation decision.

In order to support the filtering of duplicate messages, a *Receiving MSH* SHOULD save the ***MessageId*** in *persistent storage*. It is also RECOMMENDED that the following be kept in *Persistent Storage*:

- the complete message, at least until the information in the message has been passed to the application or other process that needs to process it
- the time the message was received, so that the information can be used to generate the response to a *Message Status Request* (see section 4)
- complete response message

7.2 Methods of Implementing Reliable Messaging

Support for Reliable Messaging MAY be implemented in one of the following two ways:

- using the ebXML Reliable Messaging protocol, or
- using ebXML SOAP structures together with commercial software products that are designed to provide reliable delivery of messages using alternative protocols.

7.3 Reliable Messaging SOAP header extensions

7.3.1 AckRequested element

The ***AckRequested*** element is used by the *Sending MSH* to request that a *Receiving MSH,* acting in the role of the actor URI identified in the SOAP ***actor*** attribute, returns an *Acknowledgment Message* containing an ***Acknowledgment*** element.

The ***AckRequested*** element is an OPTIONAL extension to the SOAP ***Header*** and contains the following attributes:

- a ***signed*** attribute (See 6.1.2 for details)
- a ***id*** attribute (See section 2.2.7 for details)
- a ***version*** attribute (See section 2.2.8 for details)
- a SOAP ***mustUnderstand*** attribute with a value of "1" (see section 2.2.9)
- a SOAP ***actor*** attribute

This element is used to indicate to a *Receiving MSH* which is acting in the role identified by the SOAP ***actor*** attribute whether an *Acknowledgment Message* containing an ***Acknowledgement*** element is expected, and if so, whether the message should be signed by the *Receiving MSH*.

An *ebXML Message* MAY have zero, one, or two instances of an ***AckRequested*** element. A single MSH node SHOULD only insert one ***AckRequested*** element. If there are two ***AckRequested*** elements present, then they MUST have different values for their respective SOAP ***actor*** attributes. This means that at most one ***AckRequested*** element can be targeted at the ***actor*** URI meaning *Next MSH* (see section 2.2.10) and at most one ***AckRequested*** element can be targeted at the ***actor*** URI meaning *To Party MSH* (see section 2.2.11) for any given message.

Before setting the value of the ***signed*** attribute in ***AckRequested***, the *Sending MSH* SHOULD check if the *Receiving MSH* supports *Acknowledgment Messages* of the type requested (see also [ebCPP]).

When a *Receiving MSH* receives a message with ***signed*** attribute set to ***true*** or ***false*** then it should verify that it is able to support the type of *Acknowledgment Message* requested. The default value of ***signed*** is ***false***.

- If the *Receiving MSH* can produce the *Acknowledgment Message* of the type requested, then it MUST return to the Sending *MSH* a message containing an ***Acknowledgment*** element.
- If the *Receiving MSH* cannot return an *Acknowledgment Message* of the type requested then it MUST report the error to the *Sending MSH* using an ***errorCode*** of ***NotSupported*** and a ***severity*** of ***Warning***.

If there are no errors in the message received and an *Acknowledgment Message* is being sent on its own, not as a message containing payload data, then the ***Service*** and ***Action*** MUST be set as follows:

- the ***Service*** element MUST be set to ***uri:www.oasis-open.org/messageService/***
- the ***Action*** element MUST be set to ***Acknowledgment***

7.3.2 AckRequested Element Interaction

An ***AckRequested*** element MUST NOT be included in the same message with a ***Acknowledgment*** element or an ***Error*** element. This restriction is imposed to avoid endless loops of *Acknowledgement Messages.*

7.3.2.1 SOAP actor attribute

The ***AckRequested*** element MAY be targeted at either the Next MSH or the *To Party MSH* (these are equivalent for single-hop). This is accomplished by including a SOAP ***actor*** with a URI value that is one of the two ebXML ***actor*** URIs defined in sections 2.2.10 and 2.2.11. The ***AckRequested actor*** MUST be the same as the corresponding ***Acknowledgment*** actor. The default ***actor*** targets the *To Party MSH.*

7.3.2.2 AckRequested Samples

An example of the ***AckRequested*** element is given below:

```
<eb:AckRequested SOAP:mustUnderstand="1" eb:version="1.1" eb:signed="false"
    SOAP:actor="http://oasis-open.org/committees/ebxml-msg/toPartyMSH">
```

In the preceding example, an *Acknowledgment Message* is requested of an MSH node acting in the role of the *To Party* (see section 2.2.11). The ***Acknowledgment*** element generated MUST be targeted to the ebXML MSH node acting in the role of the *From Party* along the reverse message path (end-to-end acknowledgment).

7.3.3 Acknowledgment Element

The ***Acknowledgment*** element is an OPTIONAL extension to the SOAP ***Header*** that is used by one Message Service Handler to indicate to another Message Service Handler that it has received a message. The ***RefToMessageId*** element in an ***Acknowledgment*** element is used to identify the message being acknowledged by its ***MessageId****.*

The ***Acknowledgment*** element consists of the following elements and attributes:

- a ***Timestamp*** element
- a ***RefToMessageId*** element (See section 6.2.1 for details).
- a ***From*** element
- zero or more ***ds:Reference*** element(s)
- a SOAP ***mustUnderstand*** attribute (see section 2.2.9 for details)

- a SOAP ***actor*** attribute (see section 7.3.2.1 for details)
- a ***version*** attribute (See section 2.2.8 for details)
- an ***id*** attribute (See section 2.2.7 for details)

An *ebXML Message* MAY have zero, one, or two instances of an ***Acknowledgment*** element. If there are two ***AckRequested*** elements present, then they MUST have different values for their respective SOAP ***actor*** attributes. This means that at most one ***AckRequested*** element can be targeted at the ***actor*** URI meaning *Next MSH* (see section 2.2.10) and at most one ***AckRequested*** element can be targeted at the ***actor*** URI meaning *To Party MSH* (see section 2.2.11) for any given message.

7.3.3.1 Acknowledgment Sample

An example of the ***Acknowledgment*** element targeted at the *To Party MSH* is given below:

```
<eb:Acknowledgment SOAP-ENV:mustUnderstand="1" eb:version="1.1"
    SOAP-ENV:actor="http://oasis-open.org/committees/ebxml-msg/toPartyMSH">
  <eb:Timestamp>2001-03-09T12:22:30</eb:Timestamp>
  <eb:RefToMessageId>323210:e52151ec74:-7ffc@xtacy</eb:RefToMessageId>
  <eb:From> <eb:PartyId>uri:www.example.com</eb:PartyId> </eb:From>
</eb:Acknowledgment>
```

7.3.3.2 SOAP actor attribute

The SOAP ***actor*** attribute of the ***Acknowledgment*** element SHALL have a value corresponding to the ***AckRequested*** element of the message being acknowledged. If there is no SOAP ***actor*** attribute present on an ***Acknowledgment*** element, the default target is the *To Party MSH*. There SHALL NOT be two ***Acknowledgment*** elements targeted at the *To Party MSH.*

7.3.3.3 Timestamp element

The ***Timestamp*** element is a value representing the time that the message being acknowledged was received by the *MSH* generating the acknowledgment message. It must conform to an [XMLSchema] dateTime and expressed as UTC (section 3.1.6.2).

7.3.3.4 From element

This is the same element as the ***From*** element within ***MessageHeader*** element (see section 3.1.1). However, when used in the context of an ***Acknowledgment*** element, it contains the identifier of the *Party* that is generating the A*cknowledgment Message*.

If the ***From*** element is omitted then the *Party* that is sending the element is identified by the ***From*** element in the ***MessageHeader*** element.

7.3.3.5 ds:Reference element

An Acknowledgment MAY be used to enable non-repudiation of receipt by a MSH by including one or more ***Reference*** elements from the [XMLDSIG] namespace (http://www.w3.org/2000/09/xmldsig#) derived from the message being acknowledged (See section 4.1.2 for details). The ***Reference*** element(s) MUST be namespace qualified to the aforementioned namespace and MUST conform to the XML Signature[XMLDSIG] specification. If the message being acknowledged contains a ***signed*** attribute in ***AckRequested*** set to ***Ttrue***, then the ***ds:Reference*** element is REQUIRED.

7.3.3.6 Acknowledgment element Interaction

An ***Acknowledgment*** element MAY be present on any message.

7.4 Reliable Messaging Parameters

This section describes the parameters required to control reliable messaging. This parameter information can be specified in the *CPA* or in the ***MessageHeader*** (section 3.1.2).

7.4.1 duplicateElimination

The ***duplicateElimination*** element MUST be used by the *From Party MSH* to indicate whether the Message MUST be sent reliably. Valid values are:

- ***true*** – The *To Party MSH* must persist messages in a persistent store so that duplicate messages will be presented to the *To Party* Application At-Most-Once
- ***false*** - The *To Party MSH* is not required to maintain the message in persistent store and is not required to check for duplicates.

The default value for ***duplicateElimination*** is ***false***. The ***duplicateElimination*** value of ***true*** will cause duplicate messages to be ignored.

If the ***duplicateElimination*** is set to ***true*** , the *From Party* MSH and the *To Party* MSH must adopt a reliable messaging behavior that describes how messages are resent in the case of failure. This is accomplished through the use of *Acknowledgment Messages*.

If the ***duplicateElimination*** is set to ***true***, a MSH that has received a message that it is unable to deliver MUST NOT take any action to recover or otherwise notify anyone of the problem. The MSH that sent the message MUST NOT attempt to recover from any failure. This means that duplicate messages might be delivered to an application and persistent storage of messages is not required.

If the *To Party* is unable to support the type of reliable messaging requested, the *To Party* SHOULD report the error to the *From Party* using an ***ErrorCode*** of ***NotSupported*** and a ***Severity*** of ***Error***.

7.4.2 AckRequested

The ***AckRequested*** parameter is used by the *Sending MSH* to request that a *Receiving MSH,* acting in the role of the actor URI identified in the SOAP ***actor*** attribute, returns an *Acknowledgment Message* containing an ***Acknowledgment*** element.

The ***AckRequested*** element (section 7.3.1) contains the following:

- A SOAP:***actor*** attribute

The ***AckRequested*** element MAY also contain a ***signed*** attribute. Valid values are:

- ***true*** - requests that a signed *Acknowledgment Message* is requested, or
- ***false*** - requests that an unsigned *Acknowledgment Message* is requested

The default value is ***false***. An ***AckRequested*** element that does not contain a ***signed*** attribute SHALL be interpreted as being equivalent to one with a ***signed*** attribute with the default value of ***false***.

If the ***AckRequested*** element is not present, no *Acknowledgment Message* should be sent.

7.4.3 Retries

The ***Retries*** parameter is an integer value that specifies the maximum number of times that a *Sending MSH* SHOULD attempt to redeliver an unacknowledged *message* using the same communications protocol.

7.4.4 RetryInterval

The ***RetryInterval*** parameter is a time value, expressed as a duration in accordance with the [XMLSchema] timeDuration data type. This value specifies the minimum time that a *Sending MSH* SHOULD wait between ***Retries***, if an *Acknowledgment Message* is not received or if a communications error was detected during an attempt to send the message.

7.4.5 TimeToLive

The ***TimeToLive*** parameter MUST be used to indicate the time by which a message should be delivered to and processed by the *To Party*. It must conform to an XML Schema dateTime.

In this context, the ***TimeToLive*** has expired if the time of the internal clock of the *Receiving MSH* is greater than the value of ***TimeToLive*** for the message.

If the *To Party's* MSH receives a message where ***TimeToLive*** has expired, it SHALL send a message to the *From Party* MSH, reporting that the ***TimeToLive*** of the message has expired. This message SHALL be comprised of an ***ErrorList*** containing an error that has the ***errorCode*** attribute set to **TimeToLiveExpired**, and the ***severity*** attribute set to **Error**.

TimeToLive MUST be greater than the product of ***Retries*** and ***RetryInterval*** since the message was originally sent.

7.4.6 PersistDuration

The ***PersistDuration*** parameter is the minimum length of time, expressed as a [XMLSchema] ***duration***, that data from a reliably sent *Message*, is kept in *Persistent Storage* by a *Receiving MSH*.

If the ***PersistDuration*** has passed since the message was first sent, a *Sending MSH* SHOULD NOT resend a message with the same ***MessageId***.

If a message cannot be sent successfully before ***PersistDuration*** has passed, then the *Sending MSH* should report a delivery failure (see section 7.5.6).

The timestamp for a reliably sent message (found in the message header), plus its ***PersistDuration*** (found in the CPA), must be greater than its ***TimeToLive*** (found in the message header).**ebXML**

Reliable Messaging Protocol

The ebXML Reliable Messaging Protocol is illustrated by the figure below.

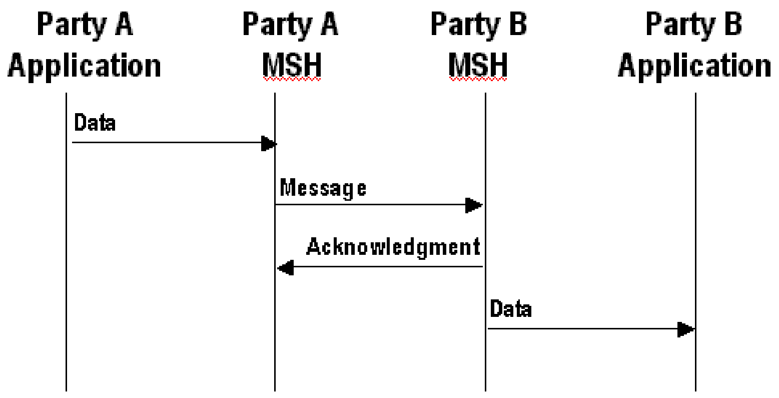


Figure 7-1 Indicating that a message has been received

The receipt of the *Acknowledgment Message* indicates that the message being acknowledged has been successfully received and either processed or persisted by the *Receiving MSH*.

An *Acknowledgment Message* MUST contain a ***MessageData*** element with a ***RefToMessageId*** that contains the same value as the ***MessageId*** element in the *message being acknowledged* and an ***Acknowledgment*** element as described in section 7.3.1.

7.5.1 Sending Message Behavior

If a MSH is given data by an application that needs to be sent reliably, then the MSH MUST do the following:

1. Create a message from components received from the application.
2. Insert an ***AckRequested*** element as defined in section 7.3.1 targeting the *To Party MSH* (end-to-end – see also multi-hop Reliable Messaging section 11.2).

3. Save the message in *persistent storage* (see section 7.1)
4. Send the message to the *Receiving MSH*
5. Wait for the return of an *Acknowledgment Message* acknowledging receipt of this specific message, and, if it does not, or if a transient error is returned, then take the appropriate action as described in section 7.5.4.

7.5.2 Receiving Message Behavior

If this is an *Acknowledgment Message* as defined in section 7 then:

1 Look for a message in *persistent storage* that has a ***MessageId*** that is the same as the value of ***RefToMessageId*** on the received Message

2 If a message is found in *persistent storage* then mark the persisted message as delivered

If an ***AckRequested*** element is present that is targeted to a role in which the *Receiving MSH* is acting (see section 2.2.10 and 2.2.11) then do the following:

1 If the message is a duplicate (i.e. there is a ***MessageId*** held in *persistent storage* that was received earlier that contains the same value as the ***MessageId*** in the received message) generate an *Acknowledgment Message* (see section 7). The *Receiving MSH* MUST NOT deliver the message to the application interface.

2 If the message is not a duplicate (there is no ***MessageId*** held in *persistent storage* that corresponds to the ***MessageId*** in the received message) then do the following:

  a Save the ***MessageId*** of the received message in *persistent storage*. As an implementation decision, the whole message MAY be stored if there are other reasons for doing so

  b Generate an *Acknowledgment Message* in response (this may be as part of another message). The *Receiving MSH* MUST NOT send an *Acknowledgment Message* until the message has be safely stored in *persistent storage*. Delivery of an *Acknowledgment Message* constitutes an obligation by the *Receiving MSH* to deliver the message to the application or forward to the next MSH in the message path as appropriate. Look in persistent storage for the first response to the received message (i.e. it contains a ***RefToMessageId*** that matches the ***MessageId*** of the received message).

    (1) If a response message was found in *persistent storage* then resend the persisted message back to the MSH that sent the received message

    (2) If no response message was found in *persistent storage,* then:

      (a) if ***syncReply*** is set to ***true*** and if the CPA indicates an application response is included, ignore the received message (i.e. no message was generated in response to the received message, or the processing of the earlier message is not yet complete)

      (b) Otherwise, generate an *Acknowledgment Message* .

A *Receiving MSH* node is NOT participating in the reliable messaging protocol for a received message if that message either; does not contain an ***AckRequested*** element, or does contain an ***AckRequested*** element that is not targeted at the *Receiving MSH*, because it is acting in a role other than that specified in the SOAP ***actor*** attribute of the received message. If the *Receiving MSH* node is operating as an intermediary along the message's message path, then it MAY use store-and-forward behavior. However, it MUST NOT filter out perceived duplicate messages from their normal processing at that node. (see section 11.2)

7.5.3 Generating an Acknowledgment Message

An *Acknowledgment Message* MUST be generated whenever a message is received with an ***AckRequested*** element that has a SOAP ***actor*** URI which targets the *Receiving MSH* node.

As a minimum, it MUST contain a ***MessageData*** element with a ***RefToMessageId*** that contains the same value as the ***MessageId*** element in the message being acknowledged and an ***Acknowledgment*** element.

Depending on the value of the ***syncReply*** parameter, the *Acknowledgment Message* can be sent at the same time as the response to the received message. In this case, the values for the ***MessageHeader*** elements of the *Acknowledgment Message* are determined by the ***Service*** and ***Action*** associated with the business response.

If an *Acknowledgment Message* is being sent on its own, then the value of the ***MessageHeader*** elements MUST be set as follows:

- The ***Service*** element MUST be set to: ***uri:www.oasis-open.org/messageService/***
- The ***Action*** element MUST be set to ***Acknowledgment***.
- The ***From*** element MAY be populated with the ***To*** element extracted from the message received and all child elements from the ***To*** element received SHOULD be included in this ***From*** element.
- The ***To*** element MAY be populated with the ***From*** element extracted from the message received and all child elements from the ***From*** element received SHOULD be included in this ***To*** element.
- The ***RefToMessageId*** element MUST be set to the ***MessageId*** of the message received.

7.5.4 Resending Lost Messages and Duplicate Filtering

This section describes the behavior that is required by the sender and receiver of a message in order to handle when messages are lost. A message is "lost" when a *Sending MSH* does not receive a positive acknowledgment to a message. For example, it is possible that a *message* was lost:

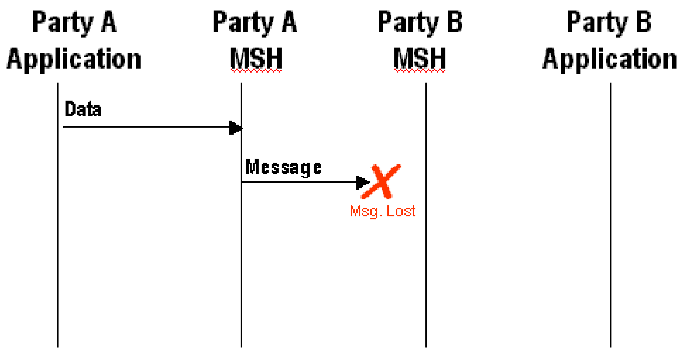


Figure 7-2 Undelivered Message

It is also possible that the *Acknowledgment Message* was lost, for example:

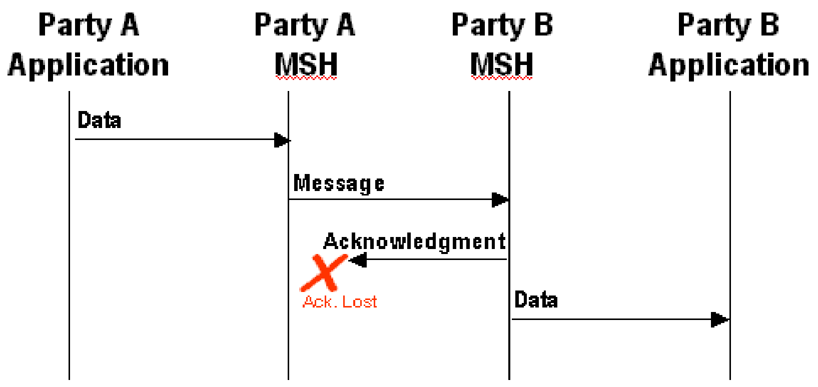


Figure 7-3 Lost Acknowledgment Message

The rules that apply are as follows:

- The *Sending MSH* MUST resend the original message if an *Acknowledgment Message* has been requested but has not been received and the following are both true:
  a) At least the time specified in the ***RetryInterval*** has passed since the message was last sent, and
  b) The message has been resent less than the number of times specified in the ***Retries*** Parameter
- If the *Sending MSH* does not receive an *Acknowledgment Message* after the maximum number of retries, the *Sending MSH* SHALL notify the application and/or system administrator function of the failure to receive an *Acknowledgment Message*.
- If the *Sending MSH* detects an unrecoverable communications protocol error at the transport protocol level, the *Sending MSH* MUST resend the message using the same algorithm as if it has not received an *Acknowledgment Message*.

7.5.5 Duplicate Message Handling

In the context of this specification, a duplicate message is:

- an "identical message" is a *message* that contains the same ebXML SOAP ***Header***, ***Body*** and ebXML Payload Container as the earlier *message* that was sent.
- a "duplicate message*"* is a *message* that contains the same ***MessageId*** as an earlier message that was received.
- the "first response message*"* is the message with the earliest ***Timestamp*** in the ***MessageData*** element that has the same ***RefToMessageId*** as the duplicate message.

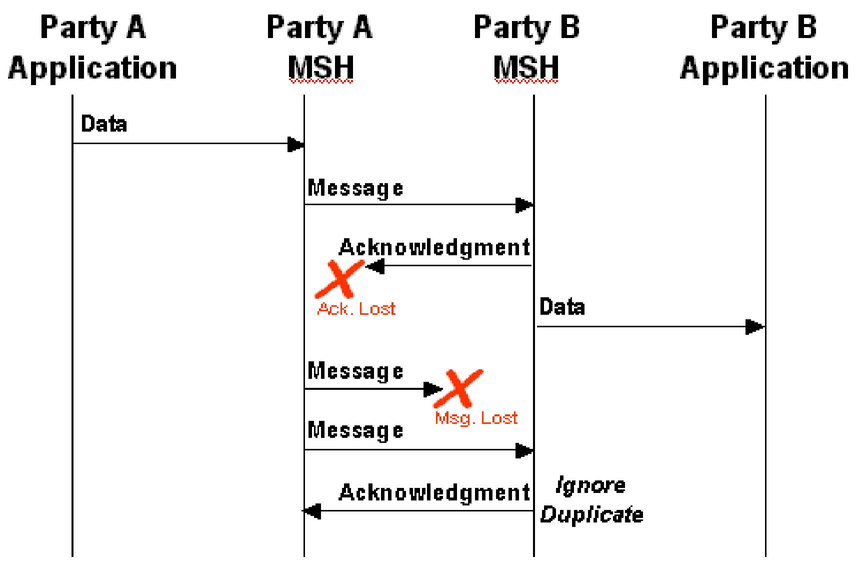


Figure 7-4 Resending Unacknowledged Messages

The diagram above shows the behavior that MUST be followed by the *Sending* and *Receiving MSH* that are sent with an ***AckRequested***. Specifically:

1) The sender of the *message* (e.g. Party A) MUST resend the "identical message*"* if no *Acknowledgment Message* is received.

2) When the recipient (Party B) of the *message* receives a "duplicate message", it MUST resend to the sender (Party A) an *Acknowledgment Message* identical to the *first response message* that was sent to the sender Party A).

3) The recipient of the *message* (Party B) MUST NOT forward the message a second time to the application/process.

7.5.6 Failed Message Delivery

If a message sent with an ***AckRequested*** element cannot be delivered, the MSH or process handling the message (as in the case of a routing intermediary) SHALL send a delivery failure notification to the *From Party.* The delivery failure notification message contains:

- a ***From*** element that identifies the *Party* who detected the problem
- a ***To*** element that identifies the *From Party* that created the message that could not be delivered
- a ***Service*** element and ***Action*** element set as described in 4.2.3.3.
- an ***Error*** element with a severity of:
  - ***Error*** if the party who detected the problem could not transmit the message (e.g. the communications transport was not available)
  - ***Warning*** if the message was transmitted, but an *Acknowledgment Message* was not received. This means the message probably was not delivered.
- an ***ErrorCode*** of ***DeliveryFailure***

It is possible that an error message with an ***Error*** element with an ***ErrorCode*** set to ***DeliveryFailure*** cannot be delivered successfully for some reason. If this occurs, then the *From Party* that is the ultimate destination for the error message MUST be informed of the problem by other means. How this is done is outside the scope of this specification

Note: If the *From Party MSH* receives an *Acknowledgment Message* from the *To Party MSH*, it SHOULD ignore all other ***DeliveryFailure*** or *Acknowledgment Messages*.

8 Message Status Service

The Message Status Request Service consists of the following:

- A Message Status Request message containing details regarding a message previously sent is sent to a Message Service Handler (MSH)
- The Message Service Handler receiving the request responds with a Message Status Response message.

A Message Service Handler SHOULD respond to Message Status Requests for messages that have been sent reliably (see section 11.1) and the ***MessageId*** in the ***RefToMessageId*** is present in *persistent storage* (see section 7.1).

A Message Service Handler MAY respond to Message Status Requests for messages that have not been sent reliably.

A Message Service SHOULD NOT use the Message Status Request Service to implement Reliable Messaging.

If a *Receiving MSH* does not support the service requested, it SHOULD return a SOAP fault with a ***faultCode*** of ***MustUnderstand***. Each service is described below.

8.1.1 Message Status Request Message

A Message Status Request message consists of an *ebXML Message* containing no ebXML Payload Container and the following elements in the SOAP ***Header*** and ***Body***:

- a ***MessageHeader*** element
  - a ***From*** element that identifies the *Party* that created the message status request message
  - a ***To*** element identifying a *Party* who should receive the message. If a ***TraceHeader*** was present on the message whose status is being checked, this MUST be set using the ***Receiver*** of the message. All ***PartyId*** elements present in the ***Receiver*** element SHOULD be included in this ***To*** element.
  - a ***Service*** element that contains: ***uri:www.oasis-open.org/messageService/***
  - an ***Action*** element that contains ***StatusRequest***
  - a ***MessageData*** element
  - a ***StatusRequest*** element containing:
  - a ***RefToMessageId*** element in ***StatusRequest*** element containing the ***MessageId*** of the message whose status is being queried.
- an OPTIONAL ***ds:Signature*** element (see section 4 for more details)

The message is then sent to the *To Party*.

8.1.2 Message Status Response Message

Once the *To Party* receives the Message Status Request message, they SHOULD generate a Message Status Response message consisting of no ebXML Payload Container and the following elements in the SOAP ***Header*** and ***Body***.

- a ***MessageHeader*** element containing:
  - a ***From*** element that identifies the sender of the Message Status Response message
  - a ***To*** element set to the value of the ***From*** element in the Message Status Request message
  - a ***Service*** element that contains the value: ***uri:www.oasis-open.org/messageService/***
  - an ***Action*** element that contains ***StatusResponse***
  - a ***MessageData*** element containing:
    - a ***RefToMessageId*** that identifies the Message Status Request message.
- ***StatusResponse*** element (see section 8.2.3)
- an OPTIONAL ***ds:Signature*** element (see section 4 for more details)

The message is then sent to the *To Party*.

8.1.3 Security Considerations

Parties who receive a Message Status Request message SHOULD always respond to the message. However, they MAY ignore the message instead of responding with ***messageStatus*** set to ***UnAuthorized*** if they consider that the sender of the message is unauthorized. The decision process that results in this course of action is implementation dependent.

8.2 StatusRequest Element

The ***StatusRequest*** element is an immediate child of a SOAP ***Body*** and is used to identify an earlier message whose status is being requested (see section 8.3.5).

The ***StatusRequest*** element consists of the following elements and attributes:

- a ***RefToMessageId*** element
- a ***version*** attribute (See section 2.2.8 for details)
- an **id** attribute (See section 2.2.7 for details)

8.2.1 RefToMessageId

A REQUIRED ***RefToMessageId*** element that contains the ***MessageId*** of the message whose status is being requested.

8.2.2 StatusRequest Sample

An example of the ***StatusRequest*** element is given below:

```
<eb:StatusRequest eb:version="1.1" >
    <eb:RefToMessageId>323210:e52151ec74:-7ffc@xtacy</eb:RefToMessageId>
</eb:StatusRequest>
```

8.2.3 StatusRequest element

A ***StatusRequest*** element MUST NOT be present with the following elements:

- a ***Manifest*** element
- a ***StatusResponse*** element
- an ***ErrorList*** element

8.3 StatusResponse element

The ***StatusResponse*** element is used by one MSH to respond to a request on the status of the processing of a message that was previously sent.

The ***StatusResponse*** element consists of the following elements and attributes:

- a ***RefToMessageId*** element
- a ***Timestamp*** element
- a ***version*** attribute (See section 2.2.8 for details)
- a ***messageStatus*** attribute
- an ***id*** attribute (See section 2.2.7 for details)

8.3.1 RefToMessageId element

A REQUIRED ***RefToMessageId*** element that contains the ***MessageId*** of the message whose status is being reported.

Note: ***RefToMessageId*** element child of the ***MessageData*** element of a message that contains a ***StatusResponse*** element SHALL have the ***MessageId*** of the message that contained the ***StatusRequest*** element to which the

StatusResponse element applies. The ***RefToMessageId*** child element of the ***StatusRequest*** or ***StatusResponse*** element SHALL contain the ***MessageId*** of the message whose status is being queried.

8.3.2 Timestamp element

The ***Timestamp*** element contains the time that the message, whose status is being reported, was received (section 3.1.6.2.). This MUST be omitted if the message whose status is being reported is ***NotRecognized*** or the request was ***UnAuthorized.***

8.3.3 messageStatus attribute

The REQUIRED ***messageStatus*** attribute identifies the status of the message that is identified by the ***RefToMessageId*** element. It SHALL be set to one of the following values:

- ***UnAuthorized*** – the Message Status Request is not authorized or accepted
- ***NotRecognized*** – the message identified by the ***RefToMessageId*** element in the ***StatusResponse*** element is not recognized
- ***Received*** – the message identified by the ***RefToMessageId*** element in the ***StatusResponse*** element has been received by the MSH
- ***Processed*** – the message identified by the ***RefToMessageId*** element in the ***StatusResponse*** element has been processed by the MSH
- ***Forwarded*** – the message identified by the ***RefToMessageId*** element in the ***StatusResponse*** element has been forwarded by the MSH to another MSH

Note: if a Message Status Request is sent after the elapsed time indicated by ***PersistDuration*** has passed since the message being queried was sent, then the Message Status Response may indicate that the ***MessageId*** was ***NotRecognized*** – the ***MessageId*** is no longer in persistent storage.

8.3.4 StatusResponse Sample

An example of the ***StatusResponse*** element is given below:

```
<eb:StatusResponse eb:version="1.1" eb:messageStatus="Received">
  <eb:RefToMessageId>323210:e52151ec74:-7ffc@xtacy</eb:RefToMessageId>
  <eb:Timestamp>2001-03-09T12:22:30</eb:Timestamp>
</eb:StatusResponse>
```

8.3.5 StatusResponse element

This element MUST NOT be present with the following elements:

- a ***Manifest*** element
- a ***StatusRequest*** element
- an ***ErrorList*** element with a ***highestSeverity*** attribute set to ***Error***

9 Message Service Handler Ping Service

The OPTIONAL Message Service Handler Ping Service enables one MSH to determine if another MSH is operating. It consists of:

- sending a Message Service Handler Ping message to a MSH, and
- the MSH that receives the Ping responding with a Message Service Handler Pong message.

If a *Receiving MSH* does not support the service requested, it SHOULD return a SOAP fault with a ***faultCode*** of ***MustUnderstand***. Each service is described below.

9.1 Message Service Handler Ping Message

A Message Service Handler Ping (MSH Ping) message consists of an *ebXML Message* containing no ebXML Payload Container and the following elements in the SOAP ***Header***:

- a ***MessageHeader*** element MUST contain the following:
  - a ***From*** element that identifies the *Party* creating the MSH Ping message
  - a ***To*** element that identifies the *Party* that is being sent the MSH Ping message
  - a ***CPAId*** element
  - a ***ConversationId*** element
  - a ***Service*** element that contains: ***uri:www.oasis-open.org/messageService/***
  - an ***Action*** element that contains ***Ping***
  - a ***MessageData*** element
- an OPTIONAL ***ds:Signature*** element (see section 4 for details).

The message is then sent to the *To Party*.

9.2 Message Service Handler Pong Message

Once the *To Party* receives the MSH Ping message, they MAY generate a Message Service Handler Pong (MSH Pong) message consisting of an ebXML Message containing no ebXML Payload Container and the following elements in the SOAP ***Header***:

- a ***MessageHeader*** element MUST contain the following:
  - a ***From*** element that identifies the creator of the MSH Pong message
  - a ***To*** element that identifies a *Party* that generated the MSH Ping message
  - a ***CPAId*** element
  - a ***ConversationId*** element
  - a ***Service*** element that contains the value: ***uri:www.oasis-open.org/messageService/***
  - an ***Action*** element that contains the value ***Pong***
  - a ***MessageData*** element containing:
    - a ***RefToMessageId*** that identifies the MSH Ping message.
- an OPTIONAL ***ds:Signature*** element (see section 4.1.1 for details).

9.3 Security Considerations

Parties who receive a MSH Ping message SHOULD always respond to the message. However, there is a risk that some parties might use the MSH Ping message to determine the existence of a Message Service Handler as part of a security attack on that MSH. Therefore, recipients of a MSH Ping MAY ignore the message if they consider that the sender of the message received is unauthorized or part of some attack. The decision process that results in this course of action is implementation dependent.

10 MessageOrder Module

The ***MessageOrder*** module allows messages to be presented to the *To Party* in a particular order. This is accomplished through the use of the ***MessageOrder*** element. It is highly RECOMMENDED that Reliable Messaging be used when a ***MessageOrder*** element is present. If a sequence is sent and one message fails to arrive at the *To Party MSH*, all subsequent messages will also fail to be presented to the *To Party* Application.

MessageOrder module SHOULD only be used in conjunction with a reliable messaging mechanism, such as that provided by the ebXML Reliable Messaging Module.

10.1 MessageOrder element

The ***MessageOrder*** element identifies to a recipient that the ordering of messages sent from the *From Party* MUST be preserved such that the *To Party* receives those messages in the order in which they were sent.

The ***MessageOrder*** element contains the following:

- a ***id*** attribute (See section 2.2.7)
- a ***version*** attribute (See section 2.2.8 for details)
- a SOAP ***mustUnderstand*** attribute (See section 2.2.9 for details)
- a ***messageOrderSemantics*** attribute
- a ***sequenceNumber*** attribute

The ***MessageOrder*** element MUST be used with the ***duplicateElimination*** attribute set to ***true***.

10.1.1 messageOrderSemantics attribute

The ***messageOrderSemantics*** attribute is used to indicate whether the message is passed to the receiving application in the order the sending application specified. Valid Values are:

- ***Guaranteed*** - The messages are passed to the receiving application in the order that the sending application specified.
- ***NotGuaranteed*** - The messages may be passed to the receiving application in different order from the order the sending application specified.

The default value for ***messageOrderSemantics*** is specified in the *CPA* or in ***MessageHeader***. If a value is not specified, the default value is ***NotGuaranteed***.

If ***messageOrderSemantics*** is set to ***Guaranteed***, the *To Party* MSH MUST correct invalid order of messages using the value of ***SequenceNumber*** in the conversation specified by the ***ConversationId***. The ***Guaranteed*** semantics can be set only when ***duplicateElimination*** is ***true***. If ***messageOrderSemantics*** is set to ***Guaranteed*** the ***SequenceNumber*** element MUST be present.

If ***duplicateElimination*** is not ***true*** and ***messageOrderSemantics*** is set to ***Guaranteed*** then report the error to the *From Party* with an ***errorCode*** of ***Inconsistent*** and a ***severity*** of ***Error*** (see section 4).

All messages sent within the same conversation, as identified by the ***ConversationId*** element, that have a ***duplicateElimination*** attribute with a value of ***true*** SHALL each have the same value ***messageOrderSemantics*** (either ***Guaranteed*** or ***NotGuaranteed***).

If ***messageOrderSemantics*** is set to ***NotGuaranteed***, then the *To Party* MSH does not need to correct invalid order of messages.

If the *To Party* is unable to support the type of ***messageOrderSemantics*** requested, then the *To Party* MUST report the error to the *From Party* using an ***errorCode*** of ***NotSupported*** and a ***severity*** of ***Error***.
A sample of ***messageOrder*** follows.

```
<eb:MessageOrder eb:messageOrderSemantics="Guaranteed"
      SOAP-ENV:mustUnderstand="1" eb:version="1.1">
   <eb:SequenceNumber eb:status="Reset">0</eb:SequenceNumber>
</eb:MessageOrder>
```

10.1.2 SequenceNumber element

The ***SequenceNumber*** element indicates the sequence in which messages MUST be processed by a *Receiving MSH*. The ***SequenceNumber*** is unique within the ***ConversationId*** and MSH. The *From Party* MSH and the *To Party* MSH each set an independent ***SequenceNumber*** as the *Sending MSH* within the ***ConversationID***. It is set to zero on the first message from that MSH for a conversation and then incremented by one for each subsequent message sent.

The ***SequenceNumber*** element MUST appear when ***duplicateElimination*** has a value of ***true*** and ***messageOrderSemantics*** has a value of ***Guaranteed***. Otherwise, it is NOT REQUIRED. However, the ***SequenceNumber*** element MUST NOT appear when ***duplicateElimination*** has a value of ***false***. If the ***SequenceNumber*** is used when these conditions are not met, an error MUST be reported to the From Party MSH with an ***errorCode*** of ***Inconsistent*** and a ***severity*** of ***Error***.

To further clarify:

- When ***duplicateElimination*** is ***true*** and ***messageOrderSemantics*** is set to ***Guaranteed***, ***SequenceNumber*** MUST be present. In this case the receiving MSH MUST guarantee message order.
- When ***duplicateElimination*** is ***true*** and ***messageOrderSemantics*** is set to ***NotGuaranteed*** or is not specified, ***SequenceNumber*** MAY be present. In this case, a receiving MSH MAY guarantee message order by using ***SequenceNumber***.

A MSH that receives a message with a ***SequenceNumber*** element MUST NOT pass the message to an application as long as the storage required to save out-of-sequence messages is within the implementation defined limits and until all the messages with lower ***SequenceNumbers*** have been received and passed to the application.

If the implementation defined limit for saved out-of-sequence messages is reached, then the *Receiving MSH* MUST indicate a delivery failure to the *Sending MSH* with ***errorCode*** set to ***DeliveryFailure*** and ***severity*** set to ***Error*** (see section 4).

The ***SequenceNumber*** element is an integer value that is incremented by the *Sending MSH* (e.g. 0, 1, 2, 3, 4...) for each application-prepared message sent by that MSH within the ***ConversationId***. The next value of 99999999 in the increment is “0". The value of ***SequenceNumber*** consists of ASCII numerals in the range 0-99999999. In following cases, ***SequenceNumber*** takes the value “0":

5) First message from the *Sending MSH* within the conversation
6) First message after resetting ***SequenceNumber*** information by the *Sending MSH*
7) First message after wraparound (next value after 99999999)

The ***SequenceNumber*** element has a single attribute, ***status***. This attribute is an enumeration, which SHALL have one of the following values:

- ***Reset*** – the ***SequenceNumber*** is reset as shown in 1 or 2 above
- ***Continue*** – the ***SequenceNumber*** continues sequentially (including 3 above)

When the ***SequenceNumber*** is set to “0" because of 1 or 2 above, the *Sending MSH* MUST set the ***status*** attribute of the message to ***Reset***. In all other cases, including 3 above, the ***status*** attribute MUST be set to ***Continue***.

A *Sending MSH* MUST wait before resetting the ***SequenceNumber*** of a conversation until it has received all of the *Acknowledgment Messages* for Messages previously sent for the conversation. Only when all the sent Messages are acknowledged, can the *Sending MSH* reset the ***SequenceNumber***. An example of ***SequenceNumber*** follows.

11 Multi-Hop Module

11.1 Via element

The ***Via*** element is an optional ebXML extension to the SOAP ***Header*** that is used to convey information to the next ebXML Message Service Handler (MSH) that receives the message.

Note: this MSH can be a MSH operated by an intermediary or by the *To Party*. In particular, the ***Via*** element is used to hold data that can vary from one hop to another.

The ***Via*** element contains the following:

- a ***id*** attribute (See section 2.2.7)
- a ***version*** attribute (See section 2.2.8 for details)
- a SOAP ***mustUnderstand*** attribute (See section 2.2.9 for details)
- a SOAP ***actor*** attribute
- a ***TraceHeaderList*** element
- a ***syncReply*** attribute. (See section 3.1.7 for details).

A receiving *ebXML Message Service* implementation that does not provide support for the ***Via*** element MUST respond with a SOAP ***Fault*** with a ***faultCode*** of **MustUnderstand**.

11.1.1 SOAP actor attribute

The ***Via*** element MUST contain a SOAP ***actor*** attribute with the value:

http://oasis-open.org/committees/ebxml-msg/nextMSH

This means the ***Via*** element MUST be processed by the MSH that receives the message and SHOULD NOT be forwarded to the next MSH. An intermediary MAY add its own ***Via*** element prior to forwarding the message to the next MSH. The ***Via*** element is NOT included in the ***Signature*** (See sections 4.1 and 11.3).

```
<eb:AckRequested SOAP:mustUnderstand="1" eb:version="1.1" eb:signed="false"
    SOAP:actor="http://oasis-open.org/committees/ebxml-msg/nextMSH">
```

In the preceding example, an *Acknowledgment Message* is requested of the next ebXML MSH node (see section 2.2.10) in the message. The ***Acknowledgment*** element generated MUST be targeted at the next ebXML MSH node along the reverse message path (the *Sending MSH*).

11.1.2 TraceHeaderList element

A ***TraceHeaderList*** element consists of one or more ***TraceHeader*** elements. Exactly one ***TraceHeader*** is appended to the ***TraceHeaderList*** following any pre-existing ***TraceHeader*** before transmission of a message over a data communication protocol.

The ***TraceHeaderList*** element MAY be omitted if the message is not being sent reliably (see section 11.2) The ***TraceHeaderList*** element MUST be present if the message is being sent reliably over multiple hops.

11.1.2.1 TraceHeader element

The ***TraceHeader*** element contains information about a single transmission of a message between two instances of a MSH. If a message traverses multiple hops by passing through one or more intermediate MSH nodes as it travels between the *From Party* MSH and the *To Party* MSH, then each transmission over each successive "hop" results in the addition of a new ***TraceHeader*** element by the *Sending MSH*.

The ***TraceHeader*** element is a composite element comprised of the following:

- ***Sender*** element
- ***Receiver*** element
- ***Timestamp*** element
- ***#wildcard*** element

In addition, the ***TraceHeader*** element MAY include an ***id*** attribute. See section 2.2.7 for details.

11.1.2.2 Sender element

The REQUIRED ***Sender*** element is a composite element comprised of the following subordinate elements:

- ***PartyId*** (See section 3.1.1.1 for details)
- ***Role*** (See section 3.1.1.2 for details).
- ***Location***

As with the ***From*** and ***To*** elements, multiple ***PartyId*** elements MAY be listed in the ***Sender*** element. This allows receiving systems to resolve those identifiers to organizations using a preferred identification scheme without prior agreement among all parties to a single scheme.

The ***PartyId*** element has the syntax and semantics described in Section 3.1.1.1, ***PartyId*** element. In this case, the identified party is the sender of the message. This element may be used in a later message addressed to this party by including it in the ***To*** element of that message.

The ***Role*** element has the syntax and semantics described in Section 3.1.1.2, ***Role*** element.

The ***Location*** element contains the URL of the Sender's Message Service Handler. Unless there is another URL identified within the *CPA* or in ***MessageHeader*** (section 3.1.2), the recipient of the message uses the URL to send a message if required. The required message from the recipient performs one of the following functions:

- responds to an earlier message
- acknowledges an earlier message
- reports an error in an earlier message.

11.1.2.3 Receiver element

The REQUIRED ***Receiver*** element is a composite element comprised of the following subordinate elements:

- ***PartyId*** (see sections 11.1.2.2)
- ***Role*** (See section 3.1.1.2 for details).
- ***Location***

As with the ***From*** and ***To*** elements, multiple ***PartyId*** elements MAY be listed in the ***Receiver*** element. This allows sending systems to resolve those identifiers to organisations using a preferred identification scheme without prior agreement among all parties to a single scheme.

The descendant elements of the ***Receiver*** element (***PartyId, Role*** and ***Location***) are implemented in the same manner as the ***Sender*** element.

11.1.2.4 Timestamp element

The REQUIRED **Timestamp** element is the time the individual ***TraceHeader*** was created. It is in the same format as in the ***Timestamp*** element in the ***MessageData*** element (section 3.1.6.2).

11.1.2.5 #wildcard element

Refer to section 2.2.6 for discussion of #wildcard element handling.

11.1.3 Multi-hop TraceHeader Sample

Multi-hop messages are not sent directly from one party to another, instead they are sent via an intermediate party, as illustrated by the diagram below:

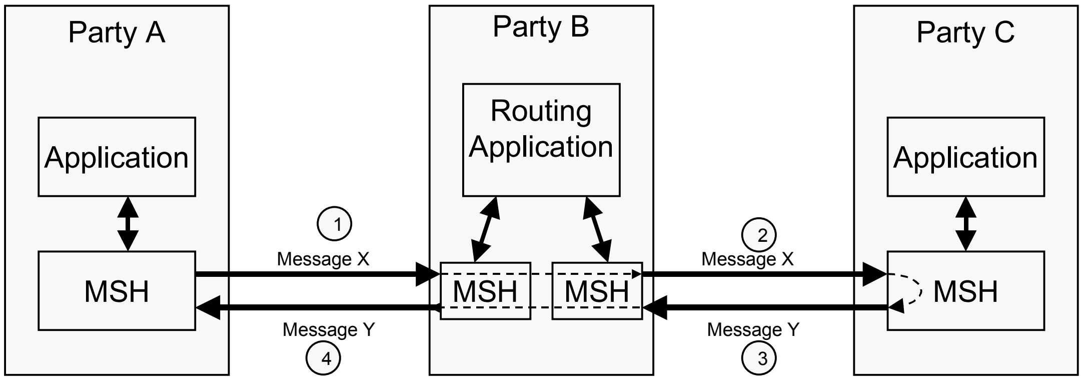


Figure 11-1 Multi-hop Message

The content of the corresponding messages could include:

Transmission 1 - Message X From Party A To Party B

```
<eb:MessageHeader eb:id="..." eb:version="1.1" SOAP-ENV:mustUnderstand="1">
  <eb:From>
```

```
      <eb:PartyId>urn:myscheme.com:id:PartyA-id</eb:PartyId>
   </eb:From>
   <eb:To>
      <eb:PartyId>urn:myscheme.com:id:PartyC-id</eb:PartyId>
   </eb:To>
   <eb:ConversationId>219cdj89dj2398djfjn</eb:ConversationId>
   ...
   <eb:MessageData>
     <eb:MessageId>29dmridj103kvna</eb:MessageId>
     ...
   </eb:MessageData>
    ...
</eb:MessageHeader>

<eb:Via SOAP-ENV:mustUnderstand="1" eb:version="1.1" eb:syncReply="false"
    SOAP-ENV:actor=" http://oasis-open.org/committees/ebxml-msg/nextMSH">
  <eb:TraceHeaderList>
    <eb:TraceHeader>
      <eb:Sender>
          <eb:PartyId>urn:myscheme.com:id:PartyA-id</eb:PartyId>
          <eb:Location>http://PartyA.com/PartyAMsh</eb:Location>
      </eb:Sender>
      <eb:Receiver>
          <eb:PartyId>urn:myscheme.com:id:PartyB-id</eb:PartyID>
          <eb:Location>http://PartyB.com/PartyBMsh</eb:Location>
      </eb:Receiver>
      <eb:Timestamp>2000-12-16T21:19:35</eb:Timestamp>
    </eb:TraceHeader>
  </eb:TraceHeaderList>
</eb:Via>
```

Transmission 2 - Message X From Party B To Party C

```
<eb:MessageHeader eb:id="..." eb:version="1.1" SOAP-ENV:mustUnderstand="1">
  <eb:From>
     <eb:PartyId>urn:myscheme.com:id:PartyB-id</eb:PartyId>
  </eb:From>
  <eb:To>
     <eb:PartyId>urn:myscheme.com:id:PartyC-id</eb:PartyId>
  </eb:To>
  <eb:ConversationId>219cdj89dj2398djfjn</eb:ConversationId>
  ...
  <eb:MessageData>
    <eb:MessageId>29dmridj103kvna</eb:MessageId>
    ...
  </eb:MessageData>
   ...
</eb:MessageHeader>

<eb:Via SOAP-ENV:mustUnderstand="1" eb:version="1.1" eb:syncReply="false"
    SOAP-ENV:actor="http://oasis-open.org/committees/ebxml-msg/nextMSH">
  <eb:TraceHeaderList>
    <eb:TraceHeader>
      <eb:Sender>
         <eb:PartyId>urn:myscheme.com:id:PartyA-id</eb:PartyId>
         <eb:Location>http://PartyA.com/PartyAMsh</eb:Location>
      </eb:Sender>
      <eb:Receiver>
         <eb:PartyId>urn:myscheme.com:id:PartyB-id</eb:PartyId>
         <eb:Location>http://PartyB.com/PartyBMsh</eb:Location>
      </eb:Receiver>
      <eb:Timestamp>2000-12-16T21:19:35</eb:Timestamp>
    </eb:TraceHeader>
    <eb:TraceHeader>
      <eb:Sender>
         <eb:PartyId>urn:myscheme.com:id:PartyB-id</eb:PartyId>
         <eb:Location>http://PartyB.com/PartyBMsh</eb:Location>
      </eb:Sender>
      <eb:Receiver>
         <eb:PartyId>urn:myscheme.com:id:PartyC-id</eb:PartyId>
```

```
        <eb:Location>http://PartyC.com/PartyCMsh</eb:Location>
      </eb:Receiver>
      <eb:Timestamp>2000-12-16T21:19:45</eb:Timestamp>
    </eb:TraceHeader>
  </eb:TraceHeaderList>
</eb:Via>
```

11.1.4 Via element Interaction

One-and-only-one ***Via*** element MAY be present in any message.

11.2 Multi-hop Reliable Messaging

The use of the ***duplicateElimination*** element is not required for Intermediate nodes. Since duplicate elimination by an intermediate MSH can interfere with End-to-End Reliable Messaging Retries, the intermediate MSH MUST know it is an intermediate and MUST NOT perform duplicate elimination tasks.

Reliable Messaging is accomplished using the ***AckRequested*** element (section 7.3.1) and an *Acknowledgment Message* containing an ***Acknowledgment*** element (section 7.3.3) each with a SOAP ***actor*** of ***Next MSH*** (section 2.2.10) between the *Sending MSH* and the *Receiving MSH*.

At this time, the values of ***Retry*** and ***RetryInterval*** between Intermediate MSHs remains implementation specific. See section 7.4 for more detail on Reliable Messaging.

11.2.1 AckRequested Sample

An example of the ***AckRequested*** element targeted at the *To Party MSH* is given below:

```
    <eb:AckRequested SOAP:mustUnderstand="1" eb:version="1.1" eb:signed="false"
        SOAP:actor="http://oasis-open.org/committees/ebxml-msg/nextMSH"/>
```

In the preceding example, an *Acknowledgment Message* is requested of the next ebXML MSH node (see section 2.2.10) in the message. The ***Acknowledgment*** element generated MUST be targeted at the next ebXML MSH node along the reverse message path (the *Sending MSH*) using the SOAP ***actor*** with a value of ***NextMSH*** (section 2.2.10).

An ***AckRequested*** element with SOAP ***actor*** of ***NextMSH*** MUST be present with a ***Via*** element. When ***AckRequested*** has a SOAP ***actor*** of ***NextMSH***, the ***To*** element on the corresponding *Acknowledgment Message* MUST contain the ***From*** information in the last ***TraceHeader*** element in the ***Via***.

Any Intermediary receiving an ***AckRequested*** with SOAP actor of ***NextMSH*** MUST remove the ***AckRequested*** element before forwarding to the next MSH. Any Intermediary MAY insert a single ***AckRequested*** element into the SOAP ***Header*** with a SOAP ***actor*** of ***NextMSH***. There SHALL NOT be two ***AckRequested*** elements targeted at the Next MSH.

11.2.2 Acknowledgment Sample

An example of the ***Acknowledgment*** element targeted at the *To Party MSH* is given below:

```
    <eb:Acknowledgment SOAP-ENV:mustUnderstand="1" eb:version="1.1"
        SOAP:actor="http://oasis-open.org/committees/ebxml-msg/nextMSH">
      <eb:Timestamp>2001-03-09T12:22:30</eb:Timestamp>
      <eb:RefToMessageId>323210:e52151ec74:-7ffc@xtacy</eb:RefToMessageId>
      <eb:From> <eb:PartyId>uri:www.example.com</eb:PartyId> </eb:From>
    </eb:Acknowledgment>
```

There SHALL NOT be two ***Acknowledgment*** elements targeted at the Next MSH.

11.2.3 Multi-Hop Acknowledgments

There MAY be two ***Acknowledgements***, possibly on the same message or on different messages, returning from either the Next MSH or from the *To Party MSH*. An MSH supporting Multi-hop MUST differentiate, based upon the ***actor***, which ***Acknowledgment*** is returning and act accordingly.

There MAY be two ***AckRequested*** elements on the same message. An *Acknowledgement Message* MUST be sent for each ***AckRequested*** using an identical SOAP ***actor*** attribute as the ***AckRequested*** element.

11.3 Signing Multi-hop Messages

In the ***ds:Signature*** element, there SHALL be a second ***ds:Transform*** element which SHALL have a child ***ds:XPath*** element with a value of:

not(ancestor-or-self::eb:Via)

NOTE: this will be changed to a transform excluding all elements with actor=next or actor=nextMSH.

The result of the first [XPath] statement excludes the ***ds:Signature*** element within which it is contained, and all its descendants (see sections 4 and 4.1.2), and this second [XPath] statement excludes the ***Via*** elements and all their descendants, as these elements are subject to change.

```
   <ds:Reference URI="">
     <ds:Transforms>
       <ds:Transform Algorithm=http://www.w3.org/2000/09/xmldsig#enveloped-signature/>
       <ds:Transform Algorithm="http://www.w3.org/TR/1999/REC-xpath-19991116">
           <XPath>  not(ancestor-or-self::eb:Via)  </XPath>
       </ds:Transform>
     </ds:Transforms>
     <ds:DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
     <ds:DigestValue>...</ds:DigestValue>
   </ds:Reference>
```

11.4 Message Ordering and Multi-Hop

Intermediary MSH nodes MUST NOT participate in Message Order processing as specified in section 10.

11.5 Reliable Messaging Combinations

	Duplicate-Elimination§	*AckRequested ToPartyMSH*	*AckRequested NextMSH*	*Comment*
1	Y	Y	Y	Once-And-Only-Once Reliable Messaging at the End-To-End and At-Least-Once to the Intermediate. Intermediate and To Party can issue DeliveryFailureNotifications if they cannot deliver.
2	Y	Y	N	Once-And-Only-Once Reliable Message at the End-To-End level only based upon end-to-end transmission
3	Y	N	Y	At-Least-Once Reliable Messaging at the Intermediate Level – Once-And-Only-Once end-to-end if all Intermediates are Reliable. No End-to-End notification.
4	Y	N	N	Duplicate Elimination only at the To Party No retries at the Intermediate or the End. Essentially Best Effort
5	N	Y	Y	At-Least-Once Reliable Messaging with Duplicates Possible at the Intermediate and the To Party.
6	N	Y	N	At-Least-Once Reliable Messaging Duplicates Possible at the Intermediate and the To Party.
7	N	N	Y	At-Least-Once Reliable Messaging to the Intermediate and at the End. No End-to-End notification.
8	N	N	N	Best Effort

§*DuplicateElimination is only at the To Party MSH,* not at the Intermediate Level.

Part III. Appendices

Appendix AebXML SOAP Extension Elements Schema

The ebXML SOAP extension elements schema has been specified using the Recommendation version of the XML Schema specification[XMLSchema].

In addition, it was necessary to craft a schema for the [XLINK] attribute vocabulary and for the XML xml:lang attribute.

Finally, because certain authoring tools do not correctly resolve local entities when importing schema, a version of the W3C XML Signature Core schema has also been provided and referenced by the ebXML SOAP extension elements schema defined in this Appendix.

These alternative schema SHALL be available from the following URL's:

XML Signature Core – http://ebxml.org/project_teams/transport/xmldsig-core-schema.xsd

Xlink - http://ebxml.org/project_teams/transport/xlink.xsd

xml:lang - http://ebxml.org/project_teams/transport/xml_lang.xsd

SOAP1.1 - http://ebxml.org/project_teams/transport/envelope.xsd

Note: if inconsistencies exist between the specification and this schema, the specification supersedes this example schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<schema targetNamespace="http://www.oasis-open.org/committees/ebxml-msg/schema/draft-msg-header-00.xsd"
  xmlns:tns="http://www.oasis-open.org/committees/ebxml-msg/schema/draft-msg-header-00.xsd"
  xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="qualified"
  version="1.0">
  <import namespace="http://www.w3.org/2000/09/xmldsig#" schemaLocation="http://www.oasis-
open.org/committees/ebxml-msg/schemas/xmldsig-core-schema.xsd"/>
  <import namespace="http://www.w3.org/1999/xlink" schemaLocation="http://www.oasis-
open.org/committees/ebxml-msg/schemas/xlink.xsd"/>
  <import namespace="http://schemas.xmlsoap.org/soap/envelope/" schemaLocation="http://www.oasis-
open.org/committees/ebxml-msg/schemas/envelope.xsd"/>
  <import namespace="http://www.w3.org/XML/1998/namespace" schemaLocation="http://www.oasis-
open.org/committees/ebxml-msg/schemas/xml_lang.xsd"/>
  <!-- MANIFEST -->
  <element name="Manifest">
    <complexType>
      <sequence>
        <element ref="tns:Reference" maxOccurs="unbounded" use="required"/>
        <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <element name="Reference">
    <complexType>
      <sequence>
        <element ref="tns:Schema" minOccurs="0" maxOccurs="unbounded"/>
        <element ref="tns:Description" minOccurs="0" maxOccurs="unbounded"/>
        <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="xlink:type" fixed="simple"/>
      <attribute ref="xlink:href" use="required"/>
      <attribute ref="xlink:role"/>
    </complexType>
  </element>
  <element name="Schema">
    <complexType>
      <attribute name="location" type="anyURI" use="required"/>
      <attribute name="version" type="tns:non-empty-string"/>
    </complexType>
  </element>
  <!-- MESSAGEHEADER -->
  <element name="MessageHeader">
    <complexType>
      <sequence>
        <element ref="tns:From" use="required"/>
        <element ref="tns:To" use="required"/>
        <element ref="tns:CPAId" use="required"/>
        <element ref="tns:ConversationId" use="required"/>
        <element ref="tns:Service" use="required"/>
        <element ref="tns:Action" use="required"/>
        <element ref="tns:MessageData" use="required"/>
        <element ref="tns:QualityOfServiceInfo" minOccurs="0"/>
        <element ref="tns:Description" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <attribute ref="soap:mustUnderstand" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <element name="CPAId" type="tns:non-empty-string"/>
  <element name="ConversationId" type="tns:non-empty-string"/>
  <element name="Service">
    <complexType>
      <simpleContent>
        <extension base="tns:non-empty-string">
          <attribute name="type" type="tns:non-empty-string"/>
        </extension>
      </simpleContent>
    </complexType>
  </element>
  <element name="Action" type="tns:non-empty-string"/>
  <element name="MessageData">
    <complexType>
      <sequence>
        <element ref="tns:MessageId" use="required"/>
        <element ref="tns:Timestamp" use="required"/>
        <element ref="tns:RefToMessageId" minOccurs="0"/>
        <element ref="tns:TimeToLive" minOccurs="0"/>
      </sequence>
    </complexType>
  </element>
  <element name="MessageId" type="tns:non-empty-string"/>
  <element name="TimeToLive" type="dateTime"/>
  <element name="QualityOfServiceInfo">
    <complexType>
      <attribute name="syncReply" type="boolean"/>
      <attribute name="duplicateElimination" type="boolean"/>
    </complexType>
  </element>
  <!-- VIA  -->
  <element name="Via">
    <complexType>
      <sequence>
        <element ref="tns:TraceHeaderList" minOccurs="0"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <attribute ref="soap:mustUnderstand" use="required"/>
      <attribute ref="soap:actor" use="required"/>
      <attribute name="syncReply" type="boolean"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <element name="TraceHeaderList">
    <complexType>
      <sequence>
        <element ref="tns:TraceHeader" maxOccurs="unbounded"/>
      </sequence>
    </complexType>
  </element>
  <element name="TraceHeader">
    <complexType>
      <sequence>
        <element ref="tns:Sender"/>
        <element ref="tns:Receiver"/>
        <element ref="tns:Timestamp"/>
        <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
    </complexType>
  </element>
  <element name="Sender" type="tns:senderReceiver.type"/>
  <element name="Receiver" type="tns:senderReceiver.type"/>
  <!-- DELIVERY RECEIPT REQUESTED-->
  <element name="DeliveryReceiptRequested">
    <complexType>
      <sequence>
        <element ref="tns:Timestamp"/>
        <element ref="ds:Reference" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute name="signed" type="boolean"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- DELIVERY RECEIPT -->
  <element name="DeliveryReceipt">
    <complexType>
      <sequence>
        <element ref="tns:Timestamp"/>
        <element ref="tns:RefToMessageId" use="required"/>
        <element ref="ds:Reference" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- ACK REQUESTED -->
  <element name="AckRequested">
    <complexType>
      <sequence>
        <element ref="tns:Timestamp"/>
        <element ref="tns:RefToMessageId" use="required"/>
        <element ref="ds:Reference" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute name="signed" type="boolean"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- ACKNOWLEDGMENT -->
  <element name="Acknowledgment">
    <complexType>
      <sequence>
        <element ref="tns:Timestamp"/>
        <element ref="tns:From" minOccurs="0"/>
        <element ref="ds:Reference" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <attribute ref="soap:mustUnderstand" use="required"/>
         default="http://oasis-open.org/committees/ebxml-msg/toPartyMSH"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- ERROR LIST -->
  <element name="ErrorList">
    <complexType>
      <sequence>
        <element ref="tns:Error" maxOccurs="unbounded"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <attribute ref="soap:mustUnderstand" use="required"/>
      <attribute name="highestSeverity" type="tns:severity.type"
        default="Warning"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <element name="Error">
    <complexType>
      <attribute ref="tns:id"/>
      <attribute name="codeContext" type="anyURI" use="required"/>
      <attribute name="errorCode" type="tns:non-empty-string" use="required"/>
      <attribute name="severity" type="tns:severity.type" default="Warning"/>
      <attribute name="location" type="tns:non-empty-string"/>
      <attribute ref="xml:lang"/>
    </complexType>
  </element>
  <!-- STATUS RESPONSE -->
  <element name="StatusResponse">
    <complexType>
      <sequence>
        <element ref="tns:RefToMessageId" use="required"/>
        <element ref="tns:Timestamp" minOccurs="0"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <attribute name="messageStatus" type="tns:messageStatus.type"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- STATUS REQUEST -->
  <element name="StatusRequest">
    <complexType>
      <sequence>
        <element ref="tns:RefToMessageId" use="required"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
    </complexType>
  </element>
  <!-- MESSAGE ORDER -->
  <element name="MessageOrder ">
    <complexType>
      <sequence>
        <element ref="tns:SequenceNumber" minOccurs="0" use="required"/>
      </sequence>
      <attribute ref="tns:id"/>
      <attribute ref="tns:version" use="required"/>
      <anyAttribute namespace="http://www.w3.org/2001/XMLSchema-instance" processContents="lax"/>
      <attribute name="messageOrderSemantics" type="tns:messageOrderSemantics.type"
default="NotGuaranteed"/>
    </complexType>
  </element>
  <element name="SequenceNumber" type="tns:sequenceNumber.type"/>
  <!-- COMMON TYPES -->
  <complexType name="senderReceiver.type">
    <sequence>
      <element ref="tns:PartyId" maxOccurs="unbounded"/>
      <element name="Role" type="anyURI"/>
      <element name="Location" type="anyURI"/>
    </sequence>
  </complexType>
  <simpleType name="status.type">
    <restriction base="NMTOKEN">
      <enumeration value="Reset"/>
      <enumeration value="Continue"/>
    </restriction>
  </simpleType>
  <simpleType name="messageStatus.type">
    <restriction base="NMTOKEN">
      <enumeration value="UnAuthorized"/>
      <enumeration value="NotRecognized"/>
      <enumeration value="Received"/>
      <enumeration value="Processed"/>
      <enumeration value="Forwarded"/>
    </restriction>
  </simpleType>
  <simpleType name="messageOrderSemantics.type">
    <restriction base="NMTOKEN">
      <enumeration value="Guaranteed"/>
      <enumeration value="NotGuaranteed"/>
    </restriction>
  </simpleType>
  <complexType name="sequenceNumber.type">
    <simpleContent>
      <extension base="positiveInteger">
        <attribute name="type" type="tns:status.type" default="Continue"/>
      </extension>
    </simpleContent>
  </complexType>
  <simpleType name="non-empty-string">
    <restriction base="string">
      <minLength value="1"/>
    </restriction>
  </simpleType>
  <simpleType name="severity.type">
    <restriction base="NMTOKEN">
      <enumeration value="Warning"/>
      <enumeration value="Error"/>
    </restriction>
  </simpleType>
  <!-- COMMON ATTRIBUTES and ELEMENTS -->
  <attribute name="id" type="ID"/>
  <attribute name="version" type="tns:non-empty-string" fixed="1.0"/>
  <element name="PartyId">
    <complexType>
      <simpleContent>
        <extension base="tns:non-empty-string">
          <attribute name="type" type="tns:non-empty-string"/>
        </extension>
      </simpleContent>
    </complexType>
  </element>
  <element name="To">
    <complexType>
      <sequence>
        <element ref="tns:PartyId" maxOccurs="unbounded"/>
        <element ref="tns:Role"/>
      </sequence>
    </complexType>
  </element>
  <element name="From">
    <complexType>
      <sequence>
        <element ref="tns:PartyId" maxOccurs="unbounded"/>
        <element ref="tns:Role"/>
      </sequence>
    </complexType>
  </element>
  <element name="Description">
    <complexType>
      <simpleContent>
        <extension base="tns:non-empty-string">
          <attribute ref="xml:lang"/>
        </extension>
      </simpleContent>
    </complexType>
  </element>
  <element name="RefToMessageId" type="tns:non-empty-string"/>
  <element name="Timestamp" type="dateTime"/>
  <element name="Role" type="anyURI"/>
</schema>
```

Appendix B Communication Protocol Bindings – Normative

B.1 Introduction

One of the goals of ebXML's Transport, Routing and Packaging team is to design a message handling service usable over a variety of network and application level communication protocols. These protocols serve as the "carrier" of ebXML Messages and provide the underlying services necessary to carry out a complete ebXML Message exchange between two parties. HTTP, FTP, Java Message Service (JMS) and SMTP are examples of application level communication protocols. TCP and SNA/LU6.2 are examples of network transport protocols. Communication protocols vary in their support for data content, processing behavior and error handling and reporting. For example, it is customary to send binary data in raw form over HTTP. However, in the case of SMTP it is customary to "encode" binary data into a 7-bit representation. HTTP is equally capable of carrying out *synchronous* or *asynchronous* message exchanges whereas it is likely that message exchanges occurring over SMTP will be *asynchronous*. This section describes the technical details needed to implement this abstract ebXML Message Handling Service over particular communication protocols.

This section specifies communication protocol bindings and technical details for carrying *ebXML Message Service* messages for the following communication protocols:

- Hypertext Transfer Protocol [HTTP], in both *asynchronous* and *synchronous* forms of transfer.
- Simple Mail Transfer Protocol [SMTP], in *asynchronous* form of transfer only.

B.2 HTTP

B.2.1 Minimum level of HTTP protocol

Hypertext Transfer Protocol Version 1.1 [HTTP] (http://www.ietf.org/rfc2616.txt) is the minimum level of protocol that MUST be used.

B.2.2 Sending ebXML Service messages over HTTP

Even though several HTTP request methods are available, this specification only defines the use of HTTP POST requests for sending *ebXML Message Service* messages over HTTP. The identity of the ebXML MSH (e.g. ebxmlhandler) may be part of the HTTP POST request:

```
        POST /ebxmlhandler HTTP/1.1
```

Prior to sending over HTTP, an ebXML Message MUST be formatted according to ebXML Message Service Specification sections 1.3 and **0**. Additionally, the messages MUST conform to the HTTP specific MIME canonical form constraints specified in section 19.4 of RFC 2616 [HTTP] specification (see: http://www.ietf.org/rfc2616.txt).

HTTP protocol natively supports 8-bit and Binary data. Hence, transfer encoding is OPTIONAL for such parts in an ebXML Service Message prior to sending over HTTP. However, content-transfer-encoding of such parts (e.g. using base64 encoding scheme) is not precluded by this specification.

The rules for forming an HTTP message containing an ebXML Service Message are as follows:

- The **`Content-Type: Multipart/Related`** MIME header with the associated parameters, from the ebXML Service Message Envelope MUST appear as an HTTP header.
- All other MIME headers that constitute the ebXML Message Envelope MUST also become part of the HTTP header.

- The mandatory `SOAPAction` HTTP header field must also be included in the HTTP header and MAY have a value of "ebXML"

  `SOAPAction`: **"ebXML"**

- Other headers with semantics defined by MIME specifications, such as Content-Transfer-Encoding, SHALL NOT appear as HTTP headers. Specifically, the "MIME-Version: 1.0" header MUST NOT appear as an HTTP header. However, HTTP-specific MIME-like headers defined by HTTP 1.1 MAY be used with the semantic defined in the HTTP specification.
- All ebXML Service Message parts that follow the ebXML Message Envelope, including the MIME boundary string, constitute the HTTP entity body. This encompasses the SOAP ***Envelope*** and the constituent ebXML parts and attachments including the trailing MIME boundary strings.

The example below shows an example instance of an HTTP POST'ed ebXML Service Message:

```
POST /servlet/ebXMLhandler HTTP/1.1
Host: www.example2.com
SOAPAction: "ebXML"
Content-type: multipart/related; boundary="BoundarY"; type="text/xml";
        start=" <ebxhmheader111@example.com>"

--BoundarY
Content-ID: <ebxhmheader111@example.com>
Content-Type: text/xml

<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope  xmlns:SOAP-ENV='http://schemas.xmlsoap.org/soap/envelope/'
  xmlns:eb= 'http://oasis-open.org/committees/ebxml-msg/schemas/'>
<SOAP-ENV:Header>
  <eb:MessageHeader SOAP-ENV:mustUnderstand="1" eb:version="1.1">
    <eb:From>
      <eb:PartyId>urn:duns:123456789</eb:PartyId>
    </eb:From>
    <eb:To>
      <eb:PartyId>urn:duns:912345678</eb:PartyId>
    </eb:To>
    <eb:CPAId>20001209-133003-28572</eb:CPAId>
    <eb:ConversationId>20001209-133003-28572</eb:ConversationId>
    <eb:Service>urn:services:SupplierOrderProcessing</eb:Service>
    <eb:Action>NewOrder</eb:Action>
    <eb:MessageData>
      <eb:MessageId>20001209-133003-28572@example.com</eb:MessageId>
      <eb:Timestamp>2001-02-15T11:12:12</Timestamp>
    </eb:MessageData>
  </eb:MessageHeader>
</SOAP-ENV:Header>
<SOAP-ENV:Body>
  <eb:Manifest SOAP-ENV:mustUnderstand="1" eb:version="1.1">
    <eb:Reference xlink:href="cid:ebxmlpayload111@example.com"
         xlink:role="XLinkRole"   xlink:type="simple">
        <eb:Description xml:lang="en-us">Purchase Order 1</eb:Description>
    </eb:Reference>
  </eb:Manifest>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

--BoundarY
Content-ID: <ebxmlpayload111@example.com>
Content-Type: text/xml

<?xml version="1.0" encoding="UTF-8"?>
<purchase_order>
  <po_number>1</po_number>
  <part_number>123</part_number>
  <price currency="USD">500.00</price>
</purchase_order>

--BoundarY--
```

B.2.3 HTTP Response Codes

In general, semantics of communicating over HTTP as specified in the [RFC2616] MUST be followed, for returning the HTTP level response codes. A 2xx code MUST be returned when the HTTP Posted message is successfully received by the receiving HTTP entity. However, see exception for SOAP error conditions below. Similarly, other HTTP codes in the 3xx, 4xx, 5xx range MAY be returned for conditions corresponding to them. However, error conditions encountered while processing an ebXML Service Message MUST be reported using the error mechanism defined by the ebXML Message Service Specification (see section 4.2.3).

B.2.4 SOAP Error conditions and Synchronous Exchanges

The SOAP 1.1 specification states:

"*In case of a SOAP error while processing the request, the SOAP HTTP server MUST issue an HTTP 500 "Internal Server Error" response and include a SOAP message in the response containing a SOAP Fault element indicating the SOAP processing error.* "

However, the scope of the SOAP 1.1 specification is limited to *synchronous* mode of message exchange over HTTP, whereas the ebXML Message Service Specification specifies both *synchronous* and *asynchronous* modes of message exchange over HTTP. Hence, the SOAP 1.1 specification MUST be followed for *synchronous* mode of message exchange, where the SOAP *Message* containing a SOAP ***Fault*** element indicating the SOAP processing error MUST be returned in the HTTP response with a response code of "HTTP 500 Internal Server Error". When *asynchronous* mode of message exchange is being used, a HTTP response code in the range 2xx MUST be returned when the message is received successfully and any error conditions (including SOAP errors) must be returned via a separate HTTP Post.

B.2.5 Synchronous vs. Asynchronous

When the ***syncReply*** attribute is set to ***true***, the response message(s) MUST be returned on the same HTTP connection as the inbound request, with an appropriate HTTP response code, as described above. When the ***syncReply*** attribute is set to ***false*** , the response messages are not returned on the same HTTP connection as the inbound request, but using an independent HTTP Post request. An HTTP response with a response code as defined in section B.2.3 above and with an empty HTTP body MUST be returned in response to the HTTP Post.

B.2.6 Access Control

Implementers MAY protect their ebXML Message Service Handlers from unauthorized access through the use of an access control mechanism. The HTTP access authentication process described in "HTTP Authentication: Basic and Digest Access Authentication" [RFC2617] defines the access control mechanisms allowed to protect an ebXML Message Service Handler from unauthorized access.

Implementers MAY support all of the access control schemes defined in [RFC2617] however they MUST support the Basic Authentication mechanism, as described in section 2, when Access Control is used.

Implementers that use basic authentication for access control SHOULD also use communication protocol level security, as specified in the section titled "Confidentiality and Communication Protocol Level Security" in this document.

B.2.7 Confidentiality and Communication Protocol Level Security

An ebXML Message Service Handler MAY use transport layer encryption to protect the confidentiality of ebXML Messages and HTTP transport headers. The IETF Transport Layer Security specification [RFC2246] provides the specific technical details and list of allowable options, which may be used by ebXML Message Service Handlers. ebXML Message Service Handlers MUST be capable of operating in backwards compatibility mode with SSL [SSL3], as defined in Appendix E of [RFC2246].

ebXML Message Service Handlers MAY use any of the allowable encryption algorithms and key sizes specified within [RFC2246]. At a minimum ebXML Message Service Handlers MUST support the key sizes and algorithms necessary for backward compatibility with [SSL3].

The use of 40-bit encryption keys/algorithms is permitted, however it is RECOMMENDED that stronger encryption keys/algorithms SHOULD be used.

Both [RFC2246] and [SSL3] require the use of server side digital certificates. In addition client side certificate based authentication is also permitted. ebXML Message Service handlers MUST support hierarchical and peer-to-peer trust models.

B.3 SMTP

The Simple Mail Transfer Protocol [SMTP] and its companion documents [RFC822] and [ESMTP] makeup the suite of specifications commonly referred to as Internet Electronic Mail. These specifications have been augmented over the years by other specifications, which define additional functionality "layered on top" of these baseline specifications. These include:

- Multipurpose Internet Mail Extensions (MIME) [RFC2045], [RFC2046], [RFC2387]
- SMTP Service Extension for Authentication [RFC2554]
- SMTP Service Extension for Secure SMTP over TLS [RFC2487]

Typically, Internet Electronic Mail Implementations consist of two "agent" types:

- Message Transfer Agent (MTA): Programs that send and receive mail messages with other MTA's on behalf of MUA's. Microsoft Exchange Server is an example of a MTA
- Mail User Agent (MUA): Electronic Mail programs are used to construct electronic mail messages and communicate with an MTA to send/retrieve mail messages. Microsoft Outlook is an example of a MUA.

MTA's often serve as "mail hubs" and can typically service hundreds or more MUA's.

MUA's are responsible for constructing electronic mail messages in accordance with the Internet Electronic Mail Specifications identified above. This section describes the "binding" of an ebXML compliant message for transport via eMail from the perspective of a MUA. No attempt is made to define the binding of an ebXML Message exchange over SMTP from the standpoint of a MTA.

B.3.1 Minimum level of supported protocols

- Simple Mail Transfer Protocol [RFC821] and [RFC822]
- MIME [RFC2045] and [RFC2046]
- Multipart/Related MIME [RFC2387]

B.3.2 Sending ebXML Messages over SMTP

Prior to sending messages over SMTP an ebXML Message MUST be formatted according to ebXML Message Service Specification sections 1.3 and 0. Additionally the messages must also conform to the syntax, format and encoding rules specified by MIME [RFC2045], [RFC2046] and [RFC2387].

Many types of data that a party might desire to transport via email are represented as 8bit characters or binary data. Such data cannot be transmitted over SMTP[SMTP], which restricts mail messages to 7bit US-ASCII data with lines no longer than 1000 characters including any trailing CRLF line separator. If a sending Message Service Handler knows that a receiving MTA, or ANY intermediary MTA's, are restricted to handling 7-bit data then any document part that uses 8 bit (or binary) representation must be "transformed" according to the encoding rules specified in section 6 of [RFC2045]. In cases where a Message Service Handler knows that a receiving MTA and ALL intermediary MTA's are capable of handling 8-bit data then no transformation is needed on any part of the ebXML Message.

The rules for forming an ebXML Message for transport via SMTP are as follows:

- If using [RFC821] restricted transport paths, apply transfer encoding to all 8-bit data that will be transported in an ebXML message, according to the encoding rules defined in section 6 of [RFC2045]. The Content-Transfer-Encoding MIME header MUST be included in the MIME envelope portion of any body part that has been transformed (encoded).
- The `Content-Type: Multipart/Related` MIME header with the associated parameters, from the ebXML Message Envelope MUST appear as an eMail MIME header.
- All other MIME headers that constitute the ebXML Message Envelope MUST also become part of the eMail MIME header.
- The `SOAPAction` MIME header field must also be included in the eMail MIME header and MAY have the value of ebXML:

  `SOAPAction`: **"ebXML"**

- The "MIME-Version: 1.0" header must appear as an eMail MIME header.
- The eMail header "To:" MUST contain the [RFC822] compliant eMail address of the ebXML Message Service Handler.
- The eMail header "From:" MUST contain the [RFC822] compliant eMail address of the senders ebXML Message Service Handler.
- Construct a "Date:" eMail header in accordance with [RFC822]
- Other headers MAY occur within the eMail message header in accordance with [RFC822] and [RFC2045], however ebXML Message Service Handlers MAY choose to ignore them.

The example below shows a minimal example of an eMail message containing an ebXML Message:

```
From: ebXMLhandler@example.com
To: ebXMLhandler@example2.com
Date: Thu, 08 Feb 2001 19:32:11 CST
MIME-Version: 1.0
SOAPAction: "ebXML"
Content-type: multipart/related; boundary="BoundarY"; type="text/xml";
        start="<ebxhmheader111@example.com>"

--BoundarY
Content-ID: <ebxhmheader111@example.com>
Content-Type: text/xml

<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope  xmlns:SOAP-ENV='http://schemas.xmlsoap.org/soap/envelope/'
  xmlns:eb='http://oasis-open.org/committees/ebxml-msg/schemas/'>
<SOAP-ENV:Header>
  <eb:MessageHeader SOAP-ENV:mustUnderstand="1" eb:version="1.1">
    <eb:From>
      <eb:PartyId>urn:duns:123456789</eb:PartyId>
    </eb:From>
    <eb:To>
      <eb:PartyId>urn:duns:912345678</eb:PartyId>
    </eb:To>
    <eb:CPAId>20001209-133003-28572</eb:CPAId>
    <eb:ConversationId>20001209-133003-28572</eb:ConversationId>
    <eb:Service>urn:services:SupplierOrderProcessing</eb:Service>
    <eb:Action>NewOrder</eb:Action>
    <eb:MessageData>
      <eb:MessageId>20001209-133003-28572@example.com</eb:MessageId>
      <eb:Timestamp>2001-02-15T11:12:12</Timestamp>
    </eb:MessageData>
    <eb:QualityOfServiceInfo eb:duplicateElimination="false"/>
  </eb:MessageHeader>
```

```
</SOAP-ENV:Header>
<SOAP-ENV:Body>
  <eb:Manifest SOAP-ENV:mustUnderstand="1" eb:version="1.1">
    <eb:Reference xlink:href="cid:ebxmlpayload111@example.com"
         xlink:role="XLinkRole"
         xlink:type="simple">
        <eb:Description xml:lang="en-us">Purchase Order 1</eb:Description>
    </eb:Reference>
  </eb:Manifest>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>

--BoundarY
Content-ID: <ebxhmheader111@example.com>
Content-Type: text/xml

<?xml version="1.0" encoding="UTF-8"?>
<purchase_order>
  <po_number>1</po_number>
  <part_number>123</part_number>
  <price currency="USD">500.00</price>
</purchase_order>

--BoundarY--
```

B.3.3 Response Messages

All ebXML response messages, including errors and acknowledgments, are delivered *asynchronously* between ebXML Message Service Handlers. Each response message MUST be constructed in accordance with the rules specified in the section titled "Sending ebXML messages over SMTP" elsewhere in this document.

ebXML Message Service Handlers MUST be capable of receiving a delivery failure notification message sent by an MTA. A MSH that receives a delivery failure notification message SHOULD examine the message to determine which ebXML message, sent by the MSH, resulted in a message delivery failure. The MSH SHOULD attempt to identify the application responsible for sending the offending message causing the failure. The MSH SHOULD attempt to notify the application that a message delivery failure has occurred. If the MSH is unable to determine the source of the offending message the MSH administrator should be notified.

MSH's which cannot identify a received message as a valid ebXML message or a message delivery failure SHOULD retain the unidentified message in a "dead letter" folder.

A MSH SHOULD place an entry in an audit log indicating the disposition of each received message.

B.3.4 Access Control

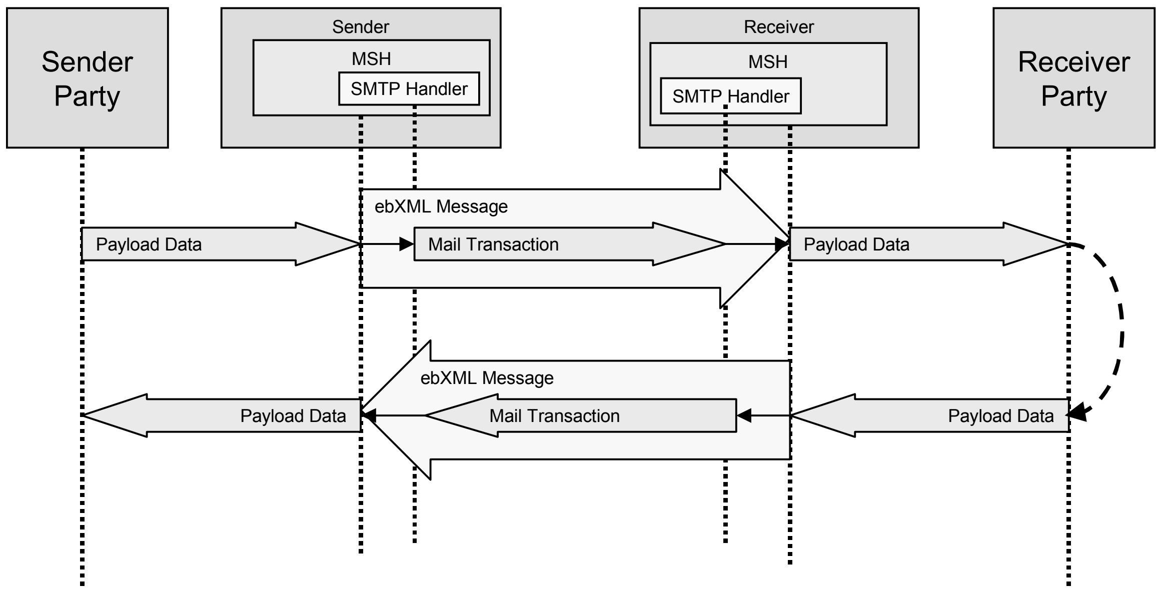
Implementers MAY protect their ebXML Message Service Handlers from unauthorized access through the use of an access control mechanism. The SMTP access authentication process described in "SMTP Service Extension for Authentication" [RFC2554] defines the ebXML recommended access control mechanism to protect a SMTP based ebXML Message Service Handler from unauthorized access.

B.3.5 Confidentiality and Communication Protocol Level Security

An ebXML Message Service Handler MAY use transport layer encryption to protect the confidentiality of ebXML messages. The IETF "SMTP Service Extension for Secure SMTP over TLS" specification [RFC2487] provides the specific technical details and list of allowable options, which may be used.

B.3.6 SMTP Model

All *ebXML Message Service* messages carried as mail in a [SMTP] Mail Transaction as shown in the figure below.



B.4 Communication Errors during Reliable Messaging

When the Sender or the Receiver detects a transport protocol level error (such as an HTTP, SMTP or FTP error) and Reliable Messaging is being used then the appropriate transport recovery handler will execute a recovery sequence. Only if the error is unrecoverable, does Reliable Messaging recovery take place (see section 7).

Appendix C Supported Security Services

The general architecture of the ebXML Message Service Specification is intended to support all the security services required for electronic business. The following table combines the security services of the *Message Service Handler* into a set of security profiles. These profiles, or combinations of these profiles, support the specific security policy of the ebXML user community. Due to the immature state of XML security specifications, this version of the specification requires support for profiles 0 and 1 only. This does not preclude users from employing additional security features to protect ebXML exchanges; however, interoperability between parties using any profiles other than 0 and 1 cannot be guaranteed.

Present in baseline MSH		Persistent digital signature	Non-persistent authentication	Persistent signed receipt	Non-persistent integrity	Persistent confidentiality	Non-persistent confidentiality	Persistent authorization	Non-persistent authorization	Trusted timestamp	Description of Profile
✓	Profile 0										no security services are applied to data

Present in baseline MSH		Persistent digital signature	Non-persistent authentication	Persistent signed receipt	Non-persistent integrity	Persistent confidentiality	Non-persistent confidentiality	Persistent authorization	Non-persistent authorization	Trusted timstamp	**Description of Profile**
✓	Profile 1	✓									*Sending MSH* applies XML/DSIG structures to message
	Profile 2		✓						✓		*Sending MSH* authenticates and *Receiving MSH* authorizes sender based on communication channel credentials.
	Profile 3		✓				✓				*Sending MSH* authenticates and both MSHs negotiate a secure channel to transmit data
	Profile 4		✓		✓						*Sending MSH* authenticates, the *Receiving MSH* performs integrity checks using communications protocol
	Profile 5		✓								*Sending MSH* authenticates the communication channel only (e.g., SSL 3.0 over TCP/IP)
	Profile 6	✓					✓				*Sending MSH* applies XML/DSIG structures to message and passes in secure communications channel
	Profile 7	✓		✓							*Sending MSH* applies XML/DSIG structures to message and *Receiving MSH* returns a signed receipt
	Profile 8	✓		✓			✓				combination of profile 6 and 7
	Profile 9	✓								✓	Profile 5 with a trusted timestamp applied
	Profile 10	✓		✓						✓	Profile 9 with *Receiving MSH* returning a signed receipt
	Profile 11	✓					✓			✓	Profile 6 with the *Receiving MSH* applying a trusted timestamp
	Profile 12	✓		✓			✓			✓	Profile 8 with the *Receiving MSH* applying a trusted timestamp
	Profile 13	✓				✓					*Sending MSH* applies XML/DSIG structures to message and applies confidentiality structures (XML-Encryption)
	Profile 14	✓		✓		✓					Profile 13 with a signed receipt
	Profile 15	✓		✓						✓	*Sending MSH* applies XML/DSIG structures to message, a trusted timestamp is added to message, *Receiving MSH* returns a signed receipt

Present in baseline MSH		Persistent digital signature	Non-persistent authentication	Persistent signed receipt	Non-persistent integrity	Persistent confidentiality	Non-persistent confidentiality	Persistent authorization	Non-persistent authorization	Trusted timstamp	**Description of Profile**
	Profile 16	✓				✓				✓	Profile 13 with a trusted timestamp applied
	Profile 17	✓		✓		✓				✓	Profile 14 with a trusted timestamp applied
	Profile 18	✓						✓			*Sending MSH* applies XML/DSIG structures to message and forwards authorization credentials [SAML]
	Profile 19	✓		✓				✓			Profile 18 with *Receiving MSH* returning a signed receipt
	Profile 20	✓		✓				✓		✓	Profile 19 with the a trusted timestamp being applied to the *Sending MSH* message
	Profile 21	✓		✓		✓		✓		✓	Profile 19 with the *Sending MSH* applying confidentiality structures (XML-Encryption)
	Profile 22					✓					*Sending MSH* encapsulates the message within confidentiality structures (XML-Encryption)

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