1 Reliable Messaging

Reliable Messaging defines an interoperable protocol such that the two Messaging Service Handlers (MSH) can "reliably" exchange messages that are sent using "reliable messaging" semantics.

"Reliably" means that the *From Party* can be highly certain that the message sent will be delivered to the *To Party*. If there is a problem in sending a message then the sender resends the message until either the message is delivered, or the sender gives up. If the message cannot be delivered, for example because there has been a catastrophic failure of the *To Party's* system, then the *From Party* is informed.

A *From Party* is informed by a *To Party* that a message has been delivered by the *To Party* returning an *Acknowledgement Message*. <DB>Added this sentence here since we need to describe an *acknowledgement message* early in the chapter. Currently it is defined after it is used.</DB>

1.1.1 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 on the technology that is used to persist the data. However, as 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.

Even 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 **Error! Reference source not found.**)

1.1.2 Methods of Implementing Reliable Messaging

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

- using the ebXML Reliable Messaging protocol, or
- using ebXML Header and Message structures together with commercial software products that are designed to provide reliable delivery of messages using alternative protocols.<*DB*>*Change elsewhere*</*DB*>

Each of these are described later.

1.2 Reliable Messaging Parameters

This section describes the parameters required to control reliable messaging. This parameter information is contained in the following:

- the *ebXML Message Header*, or

- the *CPA* that governs the processing of a message.

The table below indicates where these parameters may be set.

Parameter	CPA	Header
deliverySemantics	Yes	Yes
syncReplyMode	Yes	Yes
timeToLive	Yes	Yes
reliableMessagingMethod	No	Yes
ackRequested	No	Yes
timeout	Yes	No
retries	Yes	No
retryInterval	Yes	No
persistDuration	Yes	No

In this table, the following interpretation of the columns should be used:

1) if the **CPA** column contains a **Yes** then it indicates that the value that is present in the CPA determines the processing semantics

2) if the **CPA** column contains a **No** then it indicates that the parameter value is never specified in the **CPA**

3) <DB>I think we have four alternative interpretations here I prefer option a)<DB>:

   a) if the **Header** column contains a **Yes** then it indicates that the parameter value MAY be specified in the *ebXML Header* document. If it is present, then it overrides the value in the CPA

   b) if the Header column contains a Yes and the value of the header element differs from the equivalent in the CPA use the value in the header and report an error with ***severity*** of ***Warning*** and an ***errorCode*** of ***Inconsistent***

   c) if the Header column contains a Yes and the value of the header element differs from the equivalent in the CPA use the value in the CPA and report an error with ***severity*** of ***Warning*** and an ***errorCode*** of ***Inconsistent***

   d) if the Header column contains a Yes then the value of the header element MUST be set to the same value as in the CPA. If it differs, then report an error with ***severity*** of ***Error*** and an ***errorCode*** of ***Inconsistent<DB>***

1.2.1 Delivery Semantics

The ***deliverySemantics*** parameter may be present as either an element within the ***ebXMLHeader*** element or as a parameter within the CPA. See section **Error! Reference source not found.** for more information.

1.2.2 Sync Reply Mode

The ***syncReplyMode*** parameter may be present as either an element within the ***ebXMLHeader*** element or as a parameter within the CPA. See section **Error! Reference source not found.** for more information.

1.2.3 Time To Live

The ***TimeToLive*** element may be present within the ***ebXMLHeader*** element see section **Error! Reference source not found.** for more information.

1.2.4 Reliable Messaging Method

The ***ReliableMessagingMethod*** parameter indicates the requested method for Reliable Messaging that will be used when sending a Message. Valid values are:

- ***ebXML*** in this case the ebXML Reliable Messaging Protocol as defined in section 1) is followed, or
- ***Transport***, in this case a commercial software product is used for reliable delivery of the message, see section1.4.

1.2.5 Ack Requested

The ***AckRequested*** parameter is used by the Sending MSH to request that the Receiving MSH that receives the *Message* returns an *acknowledgment message* with an ***Acknowledgment*** element with a ***type*** of ***Acknowledgment***..

Valid values for ***IntermediateAckRequested*** are:

- ***Unsigned*** - requests that an unsigned Acknowledgement is requested
- ***Signed*** - requests that a signed Acknowledgement is requested, or
- ***None*** - indicates that no Acknowledgement is requested.

The default value is ***None***.

1.2.6 Timeout Parameter

The ***timeout*** parameter is an integer value that specifies the minimum time in seconds <DB>Perhaps this should be an XML Schema TimeDuration?. </DB> that the Sending MSH MUST wait for an *Acknowledgment Message* before first resending a message to the Receiving MSH.

1.2.7 Retries Parameter

The ***retries*** Parameter is an integer value that specifies the maximum number of times a Sending MSH SHOULD attempt to redeliver an unacknowledged or undelivered *message* using the same Communications Protocol.

1.2.8 RetryInterval Parameter

The ***retryInterval*** parameter is an integer value specifying, in seconds, <DB>Perhaps this should be an XML Schema TimeDuration?. </DB> the minimum time the Sending MSH MUST wait between retries, if an *Acknowledgment Message* is not received.

1.2.9 PersistDuration

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

A MSH SHOULD NOT resend a message with the same ***MessageId*** to a receiving MSH if the elapsed time indicated by ***persistDuration*** has passed since the message was first sent as the receiving MSH will probably not treat it as a duplicate.

If a message cannot be sent successfully before ***persistDuration*** has passed, then the MSH should report a delivery failure (see section 1.5).

1.3 ebXML Reliable Messaging Protocol

The ebXML Reliable Messaging Protocol described in this section MUST be followed if the ***deliverySemantics*** parameter/element is set to ***OnceAndOnlyOnce*** and the ***ReliableMessagingMethod*** parameter/element is set to ***ebXML*** (the default).

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

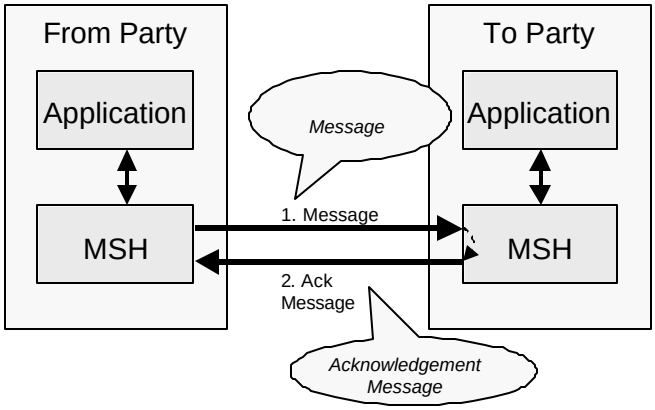


Figure 1-1 Indicating that a message has been received

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 to which the *message* was sent.

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*.

1.3.1 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 that includes:
   a) ***deliverySemantics*** set to ***OnceAndOnlyOnce***, and
   b) a ***RoutingHeader*** element that identifies the sender and the receiver URIs
2) Save the message in *persistent storage* (see section 1.1.1)
3) Send the message to the *Receiver* MSH
4) Wait for the *Receiver* MSH to return an *acknowledgment message* and, if it does not, then resend the *identical* message as described in section 1.3.2.2

1.3.2 Receiving Message Behavior

If ***deliverySemantics*** on the received message is set to ***OnceAndOnlyOnce*** then do the following:

1) Check to see if the message is a duplicate (e.g. there is a message in *persistent storage* that was received earlier that contains the same value for the ***MessageId***)

2) If the message is not a duplicate 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) If the received message contains a ***RefToMessageId*** element then do the following:

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

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

   c) Generate an *Acknowledgement Message* in response (see section 1.3.2.1). <DB>This is a simpler version of the text in version 0.93 and relies more on interpretation of other parts of the spec.</DB>

3) If the message is a duplicate, then do the following:

   a) Look in persistent storage for a response to the received message (i.e. it contains a ***RefToMessageId*** that matches the ***MessageId*** of the received message) that was *most recently sent* to the MSH that sent the received message (i.e. it has a ***RoutingHeader*** element with the greatest value of the ***Timestamp.***)<DB>Note it is not yet agreed whether the most recent message should be sent. Whatever message is sent, we need to define rules for it.</DB>

   b) If no message was found in *persistent storage* then ignore the received message as either no message was generated in response to the message, or the processing of the earlier message is not yet complete

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

1.3.2.1 Generating an Acknowledgement Message

An *Acknowledgement Message* MUST be generated whenever a message is received with:

- ***deliverySemantics*** set to ***OnceAndOnlyOnce*** and
- *reliableMessagingMethod* set to ***ebXML*** (the default).

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*.

If ***ackRequested*** in the ***RoutingHeader*** of the received message is set to ***Signed*** or ***Unsigned*** then the acknowledgement message MUST also contain an ***Acknowledgement*** element.

Depending on the value of the ***syncReplyMode*** parameter, the *Acknowledgement Message* can also be sent at the same time as the response to the processing of the received message. In this case, the values for the *Header* elements of the *Acknowledgement Message* are set by the designer of the Service (see section **Error! Reference source not found.**).

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

1) The ***Service*** element MUST be set to:
   http://www.ebxml.org/namespaces/messageService/MessageAcknowledgment

2) The ***Action*** element MUST be set to ***Acknowledgment***.

3) The ***From*** element MUST be set to the ***ReceiverURI*** from the last ***RoutingHeader*** in the *message* that has just been received

4) The ***To*** element MUST be set to the ***SenderURI*** from the last ***RoutingHeader*** in the *message* that has just been received

5) The ***RefToMessageId*** element MUST be set to the ***MessageId*** of the *message* that has just been received

6) The ***deliverySemantics*** MUST be set to BestEffort

1.3.2.2 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 response to a message. For example, it is possible that a *message* was lost, for example:

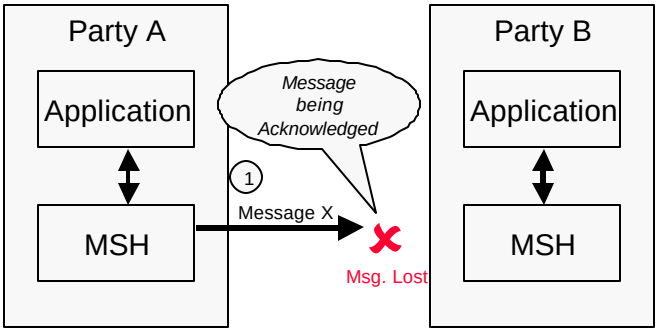


Figure 1-2 Lost "Message Being Acknowledged"

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

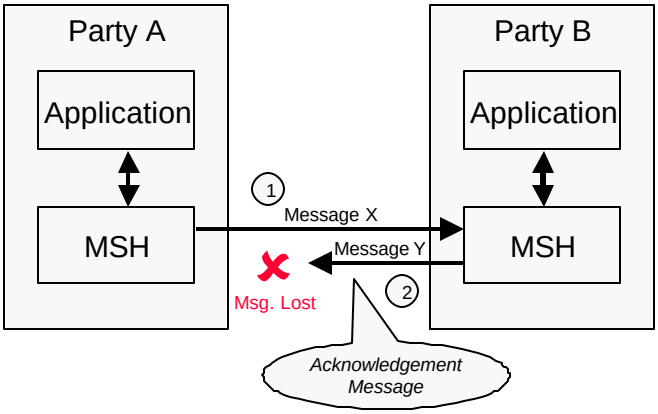


Figure 1-3 Lost Acknowledgment Message

The rules that apply are as follows:

1) The Sending MSH MUST resend the original message if an *Acknowledgment Message* has not been received from the Receiving MSH and either of the following are true:

   a) The message has not yet been resent and at least the time specified in the ***timeout*** parameter has passed since the first message was sent, or

   b) The message has been resent, and the following are both true:

i) At least the time specified in the ***retryInterval*** has passed since the last time the message was resent, and

ii) The message has been resent less than the number of times specified in the ***retries*** Parameter

2) If the Sending MSH does not receive an *Acknowledgment Message* after the maximum number of retries, the Sending MSH SHOULD notify the application and/or system administrator function.

3) If the Sending MSH detects a communications protocol error that is unrecoverable at the transport protocol level then the Sending MSH SHOULD first attempt to resend the message using the same transport protocol until the number of ***retries*** has been reached, and then again, using different communications protocols, if the CPA allows this. If these are not successful, then notify the From Party of the failure to deliver as described in section 1.5.

1.3.2.3 Duplicate Message Handling

In this context:

- an *identical message* is a *message* that contains, apart from perhaps an additional ***RoutingHeader*** element, the same *ebXML Header* and *ebXML Payload* 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 *most recent message* is the message with the latest ***Timestamp*** in the ***MessageData*** element that has the same ***RefToMessageId*** as the duplicate message that has just been received.*<DB>Chris Ferris, disagrees with resending the latest message. DB & CF need to go through this. This is carried over from the last version of the spec. </DB>*

Note that the Communication Protocol Envelope MAY be different. This means that the same message MAY be sent using different communication protocols and the reliable messaging behavior described in this section will still apply. The ability to use alternative communication protocols is specified in the CPA and is an OPTIONAL implementation specific feature.

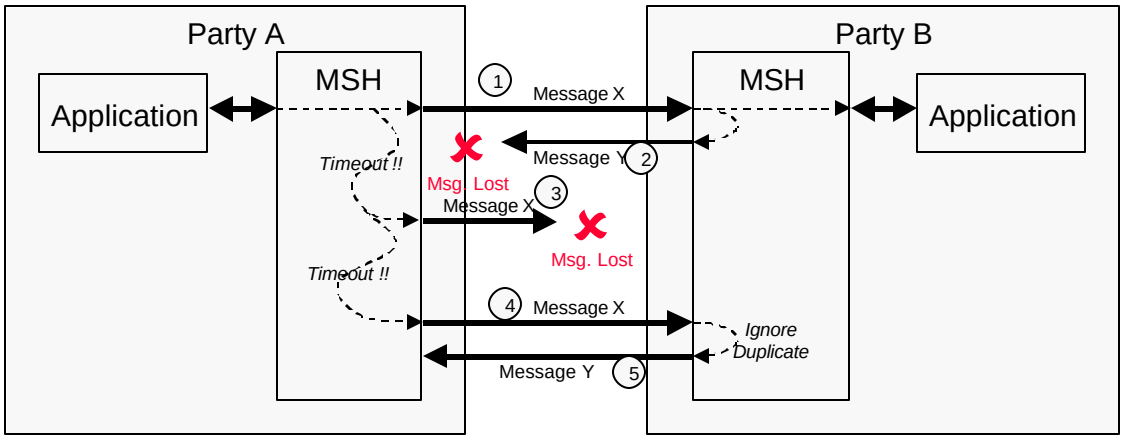


Figure 1-4 Resending Lost Messages

The diagram above shows the behavior that MUST be by the sending and receiving MSH that are sent with ***deliverySemantics*** of ***OnceAndOnlyOnce***. Specifically:

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

2) The recipient of the *message being acknowledged* (e.g. Party B), when it receives a *duplicate message*, MUST re-send to the sender of the *message* (e.g. Party A), a *message* identical to the *most recent message* that was sent to the recipient (i.e. Party A)

3) The recipient of the *message* (e.g. Party B) MUST NOT forward them a second time to the application, or other process that ultimately needs to process received messages.

1.3.3 Multi-hop Reliable Messaging

<DB>I've just concluded that we can probably do away with the complete Munlti-hop reliable messaging section if we consider the intermediary receiving MSH as acting as a proxy for the To Party MSH. This works since:

- The Acknowledgement message contains a ***From*** element that identifies the organization that generated the Acknowledgement element if it is not the To Party.
- The Routing Header can provide an audit trail (or not) if you allow multiple entries. After all, if some of the hops are not ebXML, then you cannot generate an audit trail for them

The big advantage is that it makes the behavior of the From Party the same whether or not multi-hop is being used. The text below illustrates how this could work.</DB>

Multi-hop reliable Messaging involves the sending of a message reliably from the *From Party* to the *To Party* via an intermediary that acts as a "black box". This means that the sender of a message does not need to know the address or protocols used to deliver the message to the final destination.

Multi-hop Reliable Messaging can occur either with or without Intermediate Acknowledgments.

An Intermediary knows that Multi-hop Reliable Messaging with Intermediate Acknowledgments applies if the received message contains ***ackRequested*** set to ***Signed*** or ***UnSigned***.

1.3.3.1 Multi-hop Reliable Messaging without Intermediate Acknowledgments

This is illustrated by the diagram below.

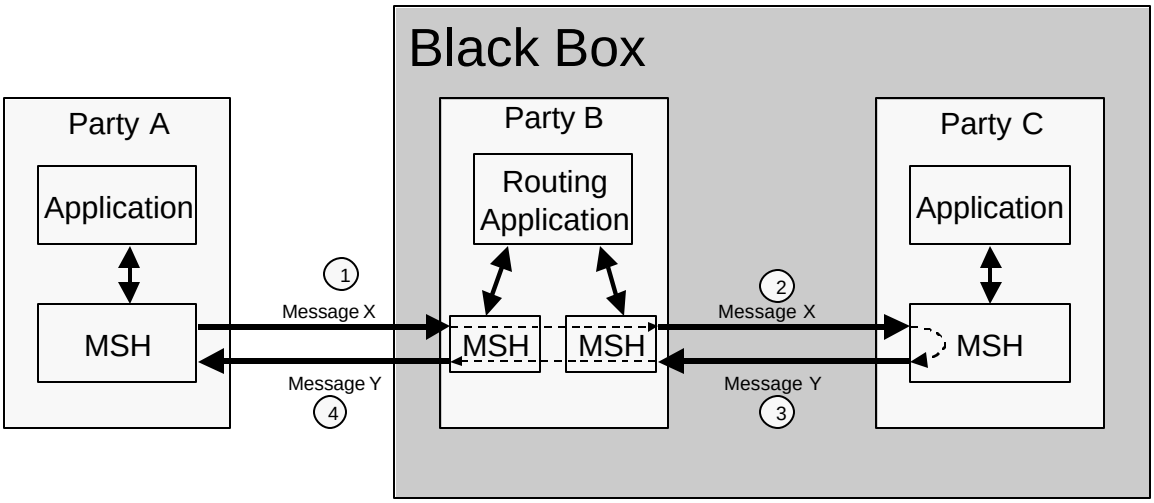


Figure 1-5 Multi-hop Reliable Messaging without Intermediate Acknowledgments

In this case, the intermediary (Party B) is acting as a proxy for the To Party (Party C).

1.3.3.2 Multi-hop Reliable Messaging with Intermediate Acknowledgments

This is illustrated by the diagram below.

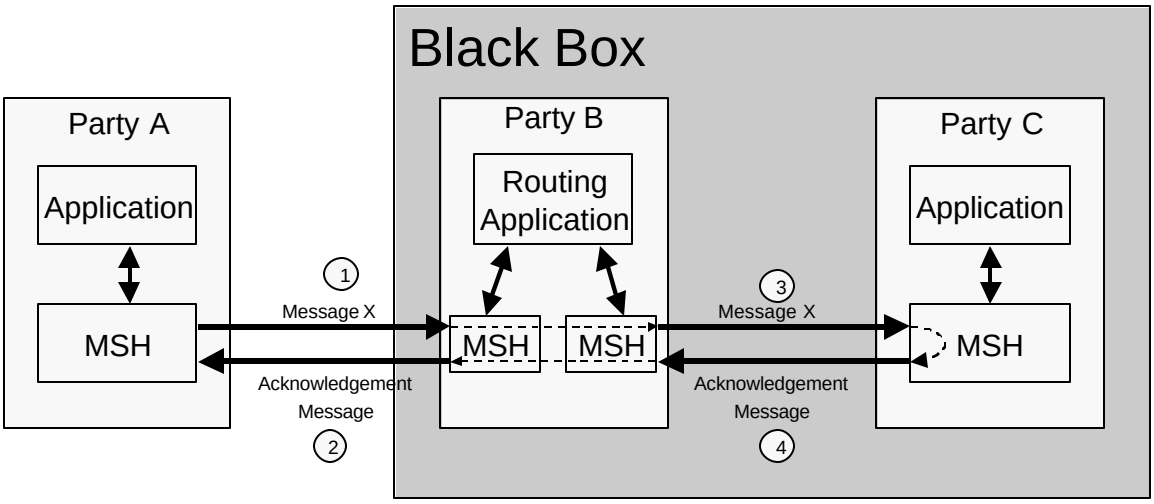


Figure 1-6 Multi-hop Reliable Messaging with Intermediate Acknowledgments

In this case, the Intermediary (Party B) accepts responsibility for delivering the message to its final destination by sending an *Acknowledgement Message* back to the sender of the original message. As far as sending and receiving of messages, the Intermediary behaves the same as a *To Party* with respect to the sending and receiving of messages.

If the Intermediary cannot, for some reason, deliver the message successfully to *To Party* (Party C), then it sends a Deli very Failure message to the *From Party* (Party A) – see section 1.5.

1.4 ebXML Reliable Messaging using Commercial Software Products

This section describes the differences that apply if commercial software products are used to implement Reliable Messaging.

Use of the ebXML Reliable Messaging Protocol is identified by the ***ReliableMessagingMethod*** parameter being set to ***Tra*** for transmission

If Reliable Messaging using a commercial software product is being used then the following rules apply:

1) Implementations should use the facilities of the commercial software product to determine if the message was delivered

2) If the software product being used reports that a message cannot be delivered then the From Party should be notified using the procedure described in section 1.5.

1.5 Failed Message Delivery

In the event that a MSH or other process that is involved, in some capacity in the delivery of a *message* that is sent with ***deliverySemantics*** set to *OnceAndOnlyOnce* has determined that the *message* cannot be delivered to the application or other process that has been designated to process the message, then that MSH or process SHOULD send a delivery failure notification *message* to the *From Party* that sent the *message*. The delivery failure notification message contains:

- a ***From Party*** that identifies the Party that detected the problem

- a ***To Party*** that identifies the ***From Party*** that created the message that could not be delivered
- a ***Service*** element and ***Action*** element set as described in **Error! Reference source not found.**
- a ***QualityOfServiceInfo*** element with ***deliverySemantics*** set to the same value as the ***deliverySemantics*** on the message that could not be delivered
- an ***Error*** element with a severity of:
  - ***Error*** if the Party that detected the problem could not even transmit the message (e.g. the communications transport was not available)
  - ***Warning*** if the message was transmitted, but no *acknowledgment message* was received. This means that the message probably was not delivered although there is a small probability that it was
- an ***ErrorCode*** of ***DeliveryFailure***

2 Parameters that need to be specified in the CPA

<DB>The following (or something similar) is not part of the TRP spec but needs to be included in the CPA spec.</DB>

2.1.1.1 Delivery Receipt Requested

The ***deliveryReceiptRequested*** parameter may be present as either an element within the ***ebXMLHeader*** element or as a parameter within the CPA. See section **Error! Reference source not found.** for more information.

2.1.1.2 Delivery Receipt Provided

The ***DeliveryReceiptProvided*** parameter indicates whether a *To Party* can provide an *acknowledgment message* with a ***type*** attribute of ***deliveryReceipt*** in response to a message. Valid values are:

- ***Signed*** - indicates that only a signed Delivery Receipt can be provided
- ***Unsigned*** - indicates only an unsigned Delivery Receipt can be provided,
- ***Both*** - indicates that either a signed or an unsigned Delivery Receipt can be provided, or
- ***None*** - indicates that the *To Party* does not create Delivery Receipts

If a MSH receives a Message where ***deliveryReceiptRequested*** is in not compatible with the value of ***DeliveryReceiptProvided*** then the MSH MUST return an *Error Message* to the *From Party* MSH, reporting that the ***DeliveryReceiptProvided*** is not supported. This must contain an ***errorCode*** set to ***NotSupported*** and a ***severity*** of Error.

2.1.1.3 Reliable Messaging Methods Supported

The ***reliableMessagingMethodsSupported*** parameter is a list of the methods that a MSH uses to support Reliable Messaging. It must be a URI. The URI for the ebXML Reliable Messaging Protocol described in section 1) is ***http://www.ebxml.org/namespaces/reliableMessaging***

2.1.1.4 PersistDuration

persistDuration is the minimum length of time, expressed as a [XMLSchema] timeDuration, that data from a *Message* that is sent reliably, is kept in *Persistent Storage* by a MSH that receives that *Message*.

In order to support the filtering of duplicate messages, a Receiving MSH MUST, as a minimum, 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 **Error! Reference source not found.**)

persistDuration is specified in the CPA.

A MSH SHOULD NOT resend a message with the same ***MessageId*** to a receiving MSH if the elapsed time indicated by ***persistDuration*** has passed since the message was first sent as the receiving MSH will probably not treat it as a duplicate.

If a message cannot be sent successfully before ***persistDuration*** has passed, then the MSH should report a delivery failure (see section 1.5).

Note that implementations may determine that a message is persisted for longer than the time specified in ***persistDuration***, for example in order to meet legal requirements or the needs of a business process. This information is recorded separately within the CPA.

In order to ensure that persistence is continuous as the message is passed from the receiving MSH to the process or application that is to handle it, it is RECOMMENDED that a message is not removed from *persistent storage* until the MSH knows that the data in the message has been received by the process/application.

2.1.1.5 MSH Time Accuracy

The ***mshTimeAccuracy*** parameter in the CPA indicates the minimum accuracy that a Receiving MSH keeps the clocks it uses when checking, for example, ***TimeToLive***. It's value is in the format "mm:ss" which indicates the accuracy in minutes and seconds.

3 Acknowledgement element

Changes required to the acknowledgement element

3.1 Acknowledgment Element

The Acknowledgment element is an optional element that is used by one Message Service Handler to indicate that another Message Service Handler has received a message.

For clarity two terms are defined:

- *message being acknowledged*. This is the Message that is has been received by a MSH that is now being acknowledged
- *acknowledgment message*. This is the message that acknowledges that the *message being acknowledged* has been received.

The *message being acknowledged* is identified by the ***RefToMessageId*** contained in the ***MessageData*** element contained within the ***Header*** Element of the acknowledgment message containing the value of the ***MessageId*** of the message being acknowledged.

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

- a ***Timestamp*** element
- a ***From*** element
- a ***signed*** attribute

3.1.1 Timestamp element

No change

3.1.2 From element

This is the same element as the ***From*** element within ***Header*** element (see section **Error! Reference source not found.**). However, when used in the context of an Acknowledgment Element, it contains the identifier of the *Party* that is generating the *acknowledgment message*.

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

3.1.3 type attribute

delete this section

3.1.4 signed attribute

No change

4 Updated XML Schema

This specifies the only required change to the Schema …

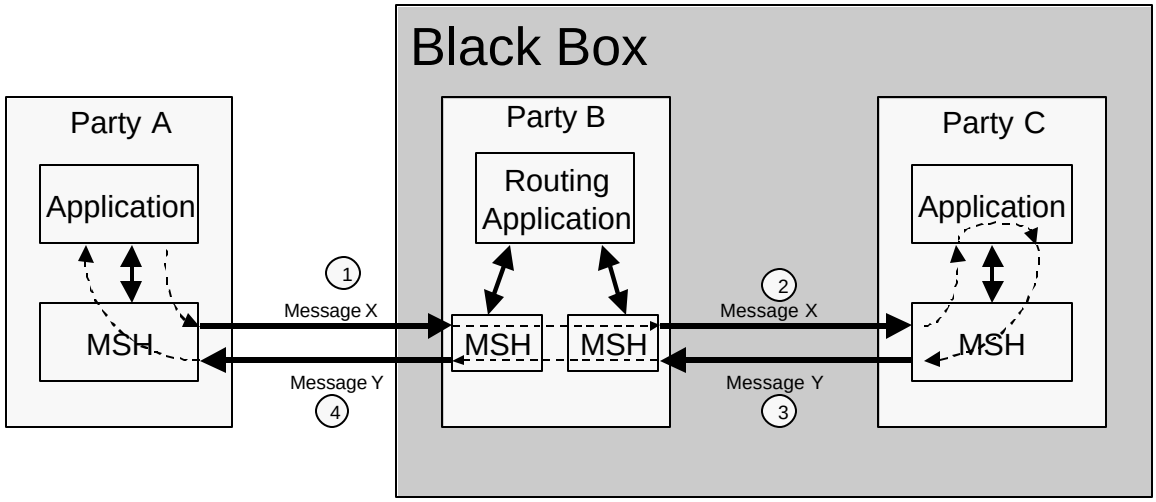
```
<!-- ACKNOWLEDGEMENT -->
   <xsd:element name="Acknowledgment">
          <xsd:complexType>
                 <xsd:sequence>
                        <xsd:element ref="Timestamp"/>
                        <xsd:element ref="From" minOccurs="0" maxOccurs="1"/>
                 </xsd:sequence>
                 <xsd:attribute name="id" type="xsd:ID"/>
                 <xsd:attribute name="type" use="default" value="DeliveryReceipt"/>
                 <xsd:simpleType>
                        <xsd:restriction base="xsd:NMTOKEN">
                               <xsd:enumeration value="DeliveryReceipt"/>
                               <xsd:enumeration value="IntermediateAck"/>
                        </xsd:restriction>
                 </xsd:simpleType>
                 <xsd:attribute name="signed" type="xsd:boolean"/>
          </xsd:complexType>
   </xsd:element>
```

... to …

```
<!-- ACKNOWLEDGEMENT -->
   <xsd:element name="Acknowledgment">
          <xsd:complexType>
                 <xsd:sequence>
                        <xsd:element ref="Timestamp"/>
                        <xsd:element ref="From" minOccurs="0" maxOccurs="1"/>
                 </xsd:sequence>
                 <xsd:attribute name="id" type="xsd:ID"/>
                 <xsd:attribute name="signed" type="xsd:boolean"/>
          </xsd:complexType>
   </xsd:element>
```

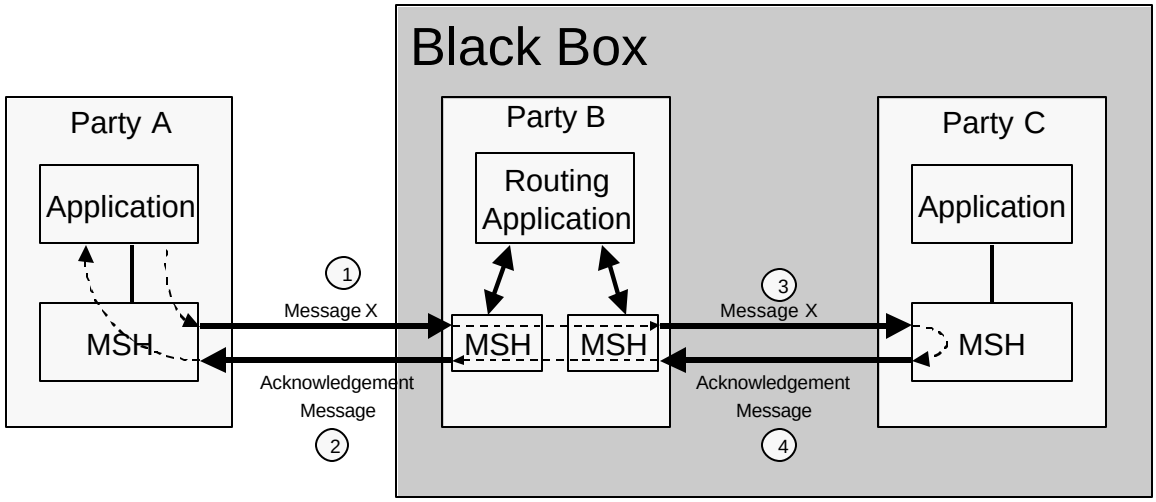
5 Non-normative examples of multi-hop

This section is not to be included in the spec but shows a number of alternative message flows that illustrate how the black box approach and multi-hop could work.



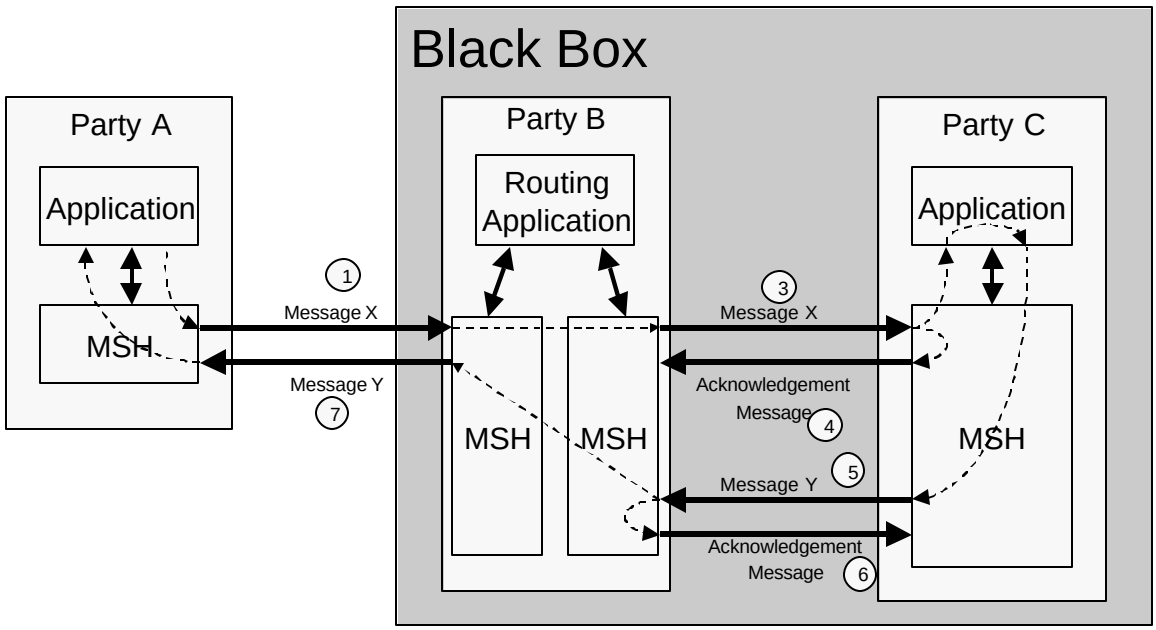
426

427



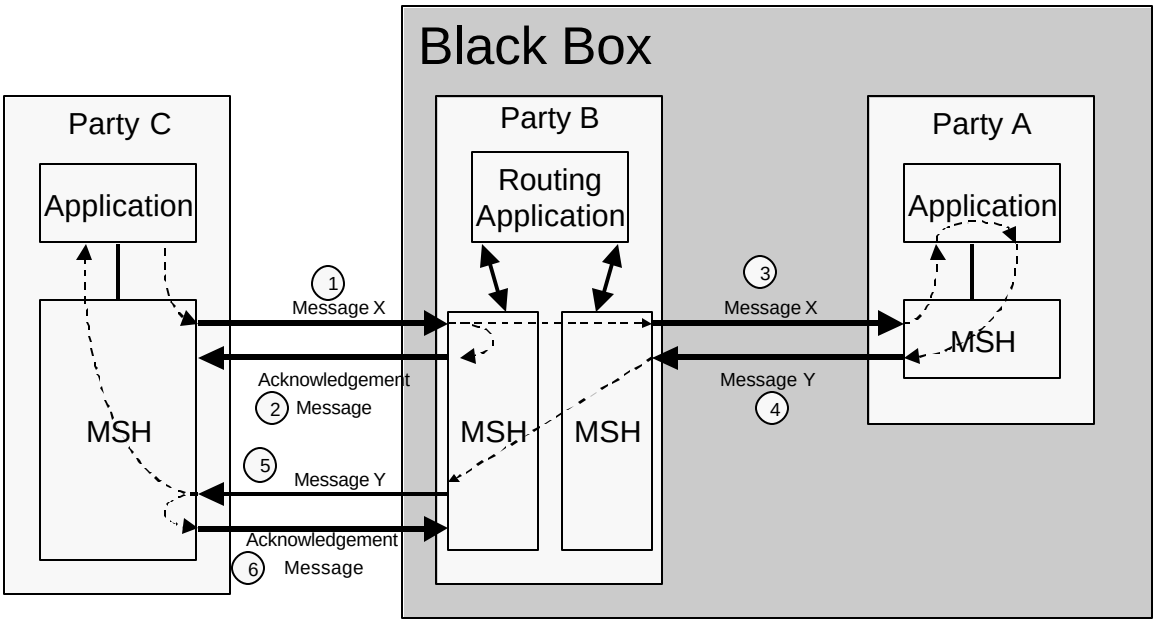
428

429


Black Box
Party A
Application
MSH
Party B
Routing Application
MSH
MSH
Party C
Application
MSH
1
Message X
Message Y
7
3
Message X
Acknowledgement Message
4
5
Message Y
Acknowledgement Message
6

430

431


Black Box
Party C
Application
MSH
Party B
Routing Application
MSH
MSH
Party A
Application
MSH
1
Message X
Acknowledgement
2
Message
5
Message Y
Acknowledgement
6
Message
3
Message X
Message Y
4

432